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FINAL REPORT

FRUIT QUALITY ASSESSMENT AND SCREENING FOR THE DEVELOPMENT AND EVALUATION OF SASKATOON, CHOKE CHERRY, AND OTHER NATIVE FRUIT CULTIVARS AND GERMPLASM

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1. Abstract/Summary

The quality characteristics of several cultivars and selections of saskatoon, choke cherry, black currant, pin cherry, and highbush cranberry fruit were evaluated. Characteristics evaluated included ten fruit weight, total solids content, pH, soluble solids, colour, titratable acidity, and anthocyanin content. Sensory analyses of saskatoon fruit pie filling and black currant juices were also conducted. The results presented are a unique collection of data allowing for the general characterization of saskatoon, choke cherry, black currant, pin cherry, and highbush cranberry fruit. A comprehensive set of data describing the quality characteristics of these fruits has not been previously reported. This information will aid fruit processors by providing detailed knowledge of starting material. Characteristics such as soluble solids content and pH are essential in the determination of product formulations. The data may also aid in developing standards of identity for the various fruits. As well, the existing data will serve as a basis for developing new fruit cultivars, monitoring the influence of environmental conditions, and assessing the impact of agronomic practices.

2. Executive Summary

The objective of this project was to evaluate the fruit quality of saskatoon, choke cherry, and other native fruit germplasm and named cultivars. The quality characteristics of several cultivars and selections of saskatoon, choke cherry, black currant, pin cherry, and highbush cranberry fruit were evaluated.

2.1 Saskatoon

The maximum ten fruit weight recorded for saskatoon fruit was that of the cultivar Martin harvested in 2000, 16.9 g, and the minimum was for the fruit of the cultivar Success harvested in 2000, 7.1 g. Fruit of the cultivars Martin, Thiessen, and Martin always had the largest ten fruit weights and the fruit of the cultivars Success and Bluff were typically lowest in ten fruit weight. The ten fruit weights were very similar between locations. The greatest, total solids content was found in the fruit of the cultivar Pembina harvested in 2000, 28.2%, and the minimum was exhibited by the fruit of the cultivars PearsonII and Forestburg harvested in 1999, 19.3%. Fruit of the cultivars Pembina and Nelson often had the highest percent total solids. Total solids content did not vary considerably among years or sites. Fruit pH ranged from 3.6 to 4.2 over the years analysed. The pH values were very consistent from year to year and between the sites. Fruit of the cultivar Nelson usually had a high soluble solids content. The maximum soluble solids content recorded was for the fruit of the cultivar Pembina harvested in 2000, 21.4°Brix, and the minimum recorded was for the fruit of the cultivar Honeywood harvested in 1999, 13.0°Brix. Generally, soluble solids contents were elevated in 2000 compared to other years. Environmental influences such as lower rainfall may have been a factor which elevated soluble solids contents. Colour comparisons were difficult to ascertain due to changes in methodology over the course of the project. However, the same methodology was employed for samples harvested in 1999 and 2000. For the fruit of each cultivar, the hue angles and chroma values were very similar in 1999 and 2000. Maximum total titratable acidity value was found for the fruit of the cultivar Nelson

harvested in 2000, 0.64% malic acid, and the minimum was 0.28% malic acid for the fruit of the cultivars Smoky and Success harvested in 1999. Fruit of the cultivars Nelson, Bluff, and Northline had the largest total anthocyanin contents in both 1999 and 2000, and also had the greatest amount of cyanidin-3-galactoside. Fruit of the cultivar Forestburg had the lowest total anthocyanin content and lowest cyanidin-3-galactoside content. Higher cyanidin-3-galactoside contents indicated greater total anthocyanin content. Fruit of the the cultivars Nelson, Buffalo, and Bluff had the highest contents of cyanidin-3-galactoside and of the two unidentified anthocyanins. In comparison to blueberry, saskatoon fruit were larger, had higher soluble solids content, were comparable in total titratable acidity, and had a lower anthocyanin content. Kalt and McDonald (1996) found blueberries to have a mean weight of 0.33 g/fruit , soluble soluble solids content of 11.2°Brix, total acid content of 0.59 %, and an anthocyanin content of 11.0 mg/g. Saskatoon fruit analysed in this studied had a weight of 0.71 to 1.69 g/fruit, soluble solids content of 13.0 to 21.4°Brix, total acid content of 0.28 to 0.64%, and an anthocyanin content of 0.357 to 0.899 mg/g. Sensory evaluation of saskatoon fruit as pie filling indicated that fruit of the cultivars Nelson and Northline had the least pleasant flavour of the fruit evaluated. The cultivar with the most pleasant flavour was Thiessen, which was not significantly different from most other cultivars. Freeze-drying was not found to be applicable to whole saskatoon fruit.

2.2 Choke cherry

Maximum ten fruit weight was greatest for fruit of the cultivar Goertz harvested in 2000, 9.6 g. Fruit of the cultivar Boughen Yellow in 1998 had the lowest ten fruit weight, 6.4 g. There were many unnamed selections harvested in 1998 which had ten fruit weight below 5.0 g. Fruit of the cultivar Lee often had high ten fruit weight. The total solids content ranged from 42.0% for the fruit of the cultivar Mini Shubert harvested in 2000 to 30.9% for the fruit of the cultivars Boughen Yellow and Lee harvested in 1999 and 2000, respectively. Typically, the fruit of the cultivar Boughen Yellow had the largest percent pit. In 1999 and 2000, fruit of the cultivar Goertz had the least percent pit among cultivars analysed. The estimated percent flesh was lowest for the fruit of the cultivar Boughen Yellow in both 1999 and 2000. The pH of choke cherry fruit was consistent from year to year and ranged overall from 3.7 to 4.3. The maximum soluble solids content was recorded for the fruit of the cultivar Mini Shubert harvested in 2000, 26.4°Brix. The minimum soluble solids content was found in the fruit of the cultivar Boughen Yellow in 1999, 12.1°Brix. It appeared that all choke cherry fruit harvested in 1997 and 1999 generally had lower soluble solids content than the choke cherry fruit harvested in 1998 and 2000. All fruit had similar hue angles in 1999 and 2000. However, colour assessment may have been skewed due to how diluted the samples were. Choke cherry may be comparable to commercially available sour cherries. Hui (1996) noted that sour cherries generally have a soluble solids content of 14.0°Brix. Choke cherry fruit typically had a high soluble solids content in comparison to sour cherries, 12.1 to 26.4°Brix and 13.0 to 20.4°Brix, respectively. Soluble solids content of choke cherry fruit analysed was greater than that found by Panford (1995) for choke cherry fruit, 9.0 to 12.3°Brix. The pH values found by Panford (1995), 4.0 to 4.3, were comparable to the values found in this study, 3.7 to 4.3. Fruit of the choke cherry cultivar Boughen Yellow does not appear particularly well suited to processing applications given its low ten fruit and large percent pit. The fruit of choke cherry cultivars such as Goertz which demonstrated large ten fruit weight and low percent pit would be more useful. Large fruit weight and low percent pit suggests the amount of utilizable fruit is maximized.

2.3 Black Currant

Fruit of the cultivar Consort harvested at Outlook consistently had the lowest ten fruit weight, 2.6 to 6.7 g. The maximum ten fruit weight was found for the fruit of the selection 5-23-42 harvested in 1999. Variations in ten fruit weight among years and between sites were negligible in most cases. Fruit of the cultivar Consort also exhibited the highest total solids content over the years harvested. The highest pH, 3.3, was noted for the fruit of the selections 5-32-42 and 5-23-23 harvested in 1997. The pH for each cultivar was very consistent among years and between sites. The maximum soluble solids content was found in the fruit of the cultivar Wellington harvested in 2000, 19.7°Brix. Soluble solids content was greatest for fruit harvested in 2000. The colour of the fruit juice extracts varied with location in 2000. Hue angles were often slightly higher for fruit harvested in 1998. The highest total titratable acidity was recorded for the fruit of the cultivar Consort harvested in 1998 at Outlook, 5.0 % as citric acid, and the minimum was recorded for the fruit of the selection 5-23-42 harvested in 1999 at Yorkton, 2.9 % as citric acid. Generally, the total titratable acidities of fruit harvested in 1998 was greater than that of fruit harvested in 1999 and 2000. Blom and Skrede (1984) evaluated four black currant cultivars over two years and found a range of soluble solids content from 13.1 to 14.9°Brix, as well as a pH range of 3.0 to 3.2 and a range of total titratable acidity from 3.1 to 4.6%. Black currant fruit were found to have a soluble solids content from 17.0 to 26.3°Brix, pH of 2.9 to 3.0, and total titratable acidity of 2.9 to 5.0% in this study. Therefore, the black currant fruit analysed were similar in pH, higher in soluble solids content, and had a greater range of acidity compared to the fruit evaluated by Blom and Skrede (1984).

2.4 Pin cherry

The maximum ten fruit weight, 8.3 g, was found for the fruit of the cultivar Lee#4 harvested in 1999 at Saskatoon. Overall, the largest ten fruit weights were recorded for fruit of cultivars harvested in 1999. Generally, total solids content was lowest for the fruit of all cultivars harvested in 2000. Among the fruit harvested in 1998, 1999, and 2000, the largest percent pit was that of the fruit of the cultivar Lee#4 harvested in 2000, 7.5% and least for that of the fruit of the cultivar Mary Liss harvested in 2000, 5.6%. The pH values were very consistent and generally the same for the fruit of all cultivars harvested in any given year. The pH values ranged from 3.1 to 3.5. The maximum soluble solids content was recorded for fruit of the cultivar Jumping Pound harvested in 1998, 20.4°Brix, and the minimum was recorded for fruit of the cultivar Lee#4 harvested in 1999, 12.4°Brix. Similar L values and hue angles were found in 1999 and 2000 for the fruit of each pin cherry cultivar harvested. Generally, fruit of the pin cherry cultivars evaluated had similar quality characteristics. Pin cherry fruit may be comparable to commercially available sour cherries. Hui (1996) noted that sour cherries generally have a soluble solids content of 14.0°Brix. Pin cherry fruit typically had a high soluble solids content in comparison.

2.5 Highbush cranberry

The maximum ten fruit weight was recorded for the fruit of the cultivar Manito harvested in 2000, 7.8 g. The minimum ten fruit weight was that of fruit of the cultivar Phillips harvested

in 1999, 3.5 g. Fruit of the cultivar Phillips harvested in 1999 also had the minimum total solids content,16.9%. Fruit of the cultivar Alaska harvested in 1999 had the largest total solids content, 21.9%, and also had the maximum estimated percent flesh, 17.1%. In both 1999 and 2000, fruit of the cultivar Garry Pink had the largest percent pit, 7.0 and 8.9%, respectively. The lowest percent pit values, in both 1999 and 2000, were those of fruit of the cultivar Manito, 4.0 and 5.1%, respectively. The pH of the fruit of the highbush cranberry cultivars harvested was consistent among cultivars and years, ranging from 2.8 to 3.3 overall. The hue angles of the fruit of all cultivars were also very similar. The pH of the highbush cranberry analysed, 2.8 to 3.3, was higher than that found by Supers et al. (1983) for bog cranberry, 2.5 to 2.7. Supers et al. (1983) also reported a soluble solids content range of 7.2 to 10.4°Brix for bog cranberry, which was generally lower than the content of highbush cranberry analysed in this study, 9.0 to 14.7°Brix. Ten fruit weight and pH were very similar between years and sites for each cultivar. Soluble solids content and percent pit were typically greater in the fruit harvested in 2000. Fruit of the highbush cranberry cultivar Manito may be suited to value added processing due to its large ten fruit weight and low percent pit. Generally, for all fruit containing pits a low percent pit values in combination with high fruit weight is desirable for processing applications. The amount of waste generated by the pit would be minimized while the amount of useable flesh would be maximized.

2.6 General Conclusions

The results presented are a unique collection of data allowing for the general characterization of saskatoon, choke cherry, black currant, pin cherry, and highbush cranberry fruit. A comprehensive set of data describing the quality characteristics of these fruits has not been previously reported. This information will aid fruit processors by providing detailed knowledge of starting material. Characteristics such as soluble solids content and pH are essential in the determination of product formulations. Further research regarding the influence of fruit characteristics on product formulations and processing parameters will aid in promoting value-added processing of native fruits. The data may also aid in developing standards of identity for the various fruits. As well, the existing data will serve as a basis to develop new fruit cultivars, monitor the influence of environmental conditions, and assess the impact of agronomic practices. Further research may involve generating models to describe the relationship between fruit quality characteristics and environmental conditions and/or agronomic practices. Continued evaluation of fruit quality characteristics is also warranted to augment the existing data.

3. Technical Report

3.1 Objectives

The objective of this project was to evaluate the fruit quality of saskatoon, choke cherry, and other native fruit germplasm and named cultivars for new cultivar development, the evaluation of cultivar performance, and the determination of the effect of management techniques on fruit quality.

3.2 Methods

3.2.1 Saskatoon

3.2.1.1 Sample collection

Saskatoon fruit samples were harvested at 1997, from four locations in Saskatchewan; Hudson Bay, Moon Lake, Saskatoon, and Yorkton. A fifth location, Makwa, SK, was not harvested in 1997 due to poor fruit production. In 1998, saskatoon fruit was harvested at Makwa, Moon Lake, Saskatoon, and Yorkton. Saskatoon fruit samples were harvested in 1999 and 2000, from two locations in Saskatchewan; Moon Lake and Saskatoon. Fruit were obtained from three plants per cultivar at each location. Each plant was considered a replicate. Fruit were also harvested in 1998 from saskatoon selections propagated at the University of Saskatchewan.

All fruit was collected with a hand held harvester (BEI, South Haven, MI) which vibrated causing fruit to fall into catch frames as the harvester was raked along plant branches (Figure 1). In 1997, samples were put into plastic bags and placed in styrofoam coolers containing a block of ice. After a transport time of up to seven hours, the fruit were then frozen in the plastic bags. In 1998, 1999, and 2000 fruit from the catch frames were put into plastic containers (25 x 19 x 8 cm) (Item Code PCA 9745, PCA Canada, Scarborough, ON) and placed in a field cooler (Figure 2). The containers were placed directly on a layer of reusable ice substitute (Cyropak Corp., Vancouver, BC) which laid on each shelf of the field cooler (Figure 2). The cooler was a plywood shell lined with styrofoam insulation. Fruit were stored in the field cooler up to seven hours before being frozen at -40 °C in the plastic containers.

3.2.1.2 Physicochemical analyses

Fruit were collected from each of three plants per cultivar from each location. Ten fruit weight was determined by weighing three replicates of ten frozen fruit. The mean weight of the replicates was reported. Total solids content was determined as per AOAC method 920.151 (AOAC, 1995). Fifteen grams of fruit were dried in a vacuum oven at 70 °C for twenty-four hours (Figure 3). Juice extracts for pH and soluble solids analyses were obtained by manually macerating 50 grams of fruit and decanting the liquid portion. The pH was measured with a Model 420A benchtop pH meter (Orion Research Inc., Boston, MA) (Figure 4). Soluble solids content was determined by refractometer (Fisher Scientific, Nepean, ON) as per AOAC method 932.12 (AOAC, 1995) (Figure 4). Titratable acidity was determined according to AOAC Method 920.149 (c) (AOAC International, 1995). Twenty grams of saskatoon fruit were boiled for 1 hour and then centrifuged at 8500 rpm for 15 minutes. The supernatant was filtered through Whatman #4 filter paper and made up to 250 ml. The volume of diluted supernatant titrated was 200 ml.

The colour of samples from 1997 was measured with 45/0 ColorQUEST colourimeter (Hunter Assoc., Reston, VA) by fully covering the viewing area with whole thawed fruit. Samples from 1998 were assessed with by cutting 15 grams of fruit in half longitudinally and placing the fruit in a 60mm diameter petri dish such that only hulls were exposed to the Miniscan XE colourimeter (Hunter Assoc., Reston, VA) (Figure 5). The colour of the juice extracted for

pH and soluble solids determination was measured in 1999 and 2000 with the Miniscan XE colourimeter (Hunter Assoc., Reston, VA) (Figure 5). The hue angle ($\tan^{-1}(b/a)$) was calculated to determine whether the measured colour tended towards red, yellow, blue or green (Figure 6). The chroma (square root of $(a^2 + b^2)$), which indicates the vividness of the colour, was also calculated to allow the colour to be graphically represented (Figure 6). The L value indicates how light or dark the sample is.

The amount of juice extracted from the saskatoon fruit was measured by pressing 25 g of fruit with a TMS-90 texturepress (Food Technology Corporation, Rockville, MD) (Figure 7). A 1000 lb transducer was used with flat plates and the fruit was compressed to 90% of its original height. The pressed fruit and resulting juice were centrifuged for 45 min at 7500 rpm. The supernatant was decanted, measured, and recorded as the volume of juice extracted.

Extracts were prepared for anthocyanin analysis by blending 20 g of thawed fruit with 50 mL of 0.1% HCl in methanol. The mixture was stored at 4°C overnight, then filtered through Whatman #4 filter paper. The cake was rinsed with approximately 200 mL of extracting solvent. The filtrate was made up to 250 mL with extracting solvent. Extracts were stored at -40°C. Prior to HPLC injection extracts were filtered through 0.45 μm filters.

HPLC analysis of anthocyanin extracts was performed using a Waters Chromotograph gradient component system (Milford, MA) equipped with a Waters 600E multisolvent delivery system, Waters 717 plus autosampler, and a Waters 996 photodiode array detector. A 5μL injection of extract was separated on a NovaPak C18 column (4 μm, 3.9 X 150 mm, 3.9 X 20 mm NovaPak Sentry guard column; Waters, Milford, MA). The solvents used for component separation were 10% formic acid in water (solvent A) and 0.1% HCl in methanol (solvent B). The elution profile was as follows: linear gradient 0-20 min, 10-65% B; linear gradient 20-25 min, 65-100% B; isocratic 25-30 min, 100% B. The flow rate was 1 mL/min and absorbance data was collected at 520 nm. Standard curves were generated by injecting different volumes of standard solution. The standard solution contained the anthocyanins cyanidin-3-galactoside (42 ng/μL) (Extrasynthese, Genay, France) and cyanidin-3-glucoside (41.6 ng/μL) (Extrasynthese, Genay Cedex, France). Linear regression coefficients of 1.00 were obtained for both anthocyanins in the standard solution. Amounts of the anthocyanins in the saskatoon fruit were determined from the standard curve, with unidentified anthocyanins calculated as cyanidin-3-galactoside.

Results from 1998 were statistically analyzed by analysis of variance and mean separation was accomplished by Tukey's Test (SYSTAT 7.0, SPSS, Chicago, IL). For all other years, data were statistically analyzed using the general linear model procedure (PROC GLM) of Statistical Analysis Software Version 6.11 (SAS Institute, Gary, NY). Either the least significant difference (LSD) option or the probability of difference (PDIFF) option were used to determine significant differences among the fruit of the cultivars.

3.2.1.3 Sensory evaluation of saskatoon fruit as pie filling

Fruit of saskatoon cultivars were assessed according to a completely randomized block experimental design for each pie filling characteristic evaluated. The characteristics assessed were tartness, sweetness, firmness, seediness, flavour intensity, and flavour acceptability. Fruit of the following saskatoon cultivars harvested in 1997 from various locations around Saskatchewan were employed: Bluff, Buffalo, Honeywood, Martin, Nelson, Northline, Par90TRS, Pasture, Pembina, Quaker, Regent, Smoky, Success, and Thiessen. Pie filling made from fruit of each cultivar was assessed six times throughout the study. Samples were evaluated as per a multiple comparison sensory method utilizing category scaling (Larmond, 1977 and Meilgaard et al., 1991). Panelists rated samples by comparing them to a reference. Fruit of the saskatoon variety Thiessen was used as the reference sample throughout the study, except in the case of the screening sessions. A total of five samples was evaluated per session. By utilizing a multiple comparison test, the direction and magnitude of differences among samples could be assessed.

Six sessions were used to screen panelists (Table 1). Panelists able to recognize samples with increased/decreased sugar, increased/decreased malic acid, and added flavours were asked to continue. Of the twenty four panelists screened, sixteen were selected to continue with the study. Nine were female and seven were male. Eight panelists were between the ages of eighteen and thirty five years, six were between the ages of thirty-five and fifty years, and two panelists were over the age of fifty years. When asked how often they consumed pies with fruit fillings, eleven panelists responded that they did once or more per month. The remaining five responded that they seldom did. The majority of panelists cited their consumption of saskatoon to be infrequent and dependent on whether the fruit were in season.

Harvested fruit were washed and frozen, and stored for approximately three months prior to being made into pie filling. The pie filling formulation used is shown in Table 2. The sugar and starch were combined then the water was added and the mixture boiled for two minutes. Next, the saskatoons were added and the mixture was boiled for an additional minute. Hot sterilized jars were filled and processed for thirty minutes in boiling water. Jars were stored in the dark at 10°C. Samples were allowed to equilibrate to ambient temperature prior to presentation and were served to panelists within five hours of opening a jar.

Approximately 30 grams of sample and 50 grams of the reference sample were placed in plastic disposal cups. The reference sample was coded "R". Other samples were coded with three digit random numbers and presented in random order. Panelists were instructed to take a drink of water before starting and between the tasting of samples. They were also instructed that a bit of cracker may be used to clean the palate between samples. Samples were swallowed. Panels were conducted in an isolated room with seven separate booths under blue light, which masked differences in sample colour.

Numerical responses were equated to the category scale descriptors. Descriptors ranged from "extremely more" or "extremely stronger" which was equated to a numerical response of one, to "extremely less" or "extremely weaker" which equated to a numerical response of nine (Table 3). When a sample was described as equal to the reference the numerical response was

five. The mean numerical responses from the six replicates of each cultivar were used for analysis of variance. An analysis of variance was performed for tartness, sweetness, firmness, seediness, flavour intensity, and flavour acceptability (SYSTAT 7.0, SPSS, Chicago, IL). Tukey's Test was then utilized to determine which cultivars were significantly different from each other (SYSTAT 7.0, SPSS, Chicago, IL). The consistency of the panelists' response to a hidden reference was also statistically assessed via analysis of variance and Tukey's Tests (SYSTAT 7.0, SPSS, Chicago, IL).

3.2.1.4 Lyophilization/freeze-drying of saskatoon fruit

A sample of frozen saskatoon fruit was subjected to lyophilization, or freeze-drying. Approximately 450 grams of whole frozen fruit were moved directly from -40 °C to a freeze drier (Labconco, Kanas City, MO). The sample was visually monitored twice a day for five days.

3.2.2 Choke cherry

3.2.2.1 Sample collection

In 1997, fruit of choke cherry cultivars and unnamed selections were harvested at Alberta, Indian Head, SK, and Saskatoon, SK. Choke cherry fruit was harvested from cultivar trials at Saskatoon, SK and Outlook, SK in 1998, 1999, and 2000. Fruit were obtained from three plants per cultivar at each location. Fruit were also harvested in 1998 from choke cherry selections propagated at the University of Saskatchewan.

Fruit were collected manually and with a hand held harvester (BEI, South Haven, MI) which vibrated causing fruit to fall into catch frames as the harvester was raked along plant branches (Figure 1). In 1997, samples were put into plastic bags and placed in styrofoam coolers containing a block of ice. After a transport time of up to seven hours, the fruit were then frozen in the plastic bags. In 1998, 1999, and 2000 fruit were put into plastic containers (25 x 19 x 8 cm) (Item Code PCA 9745, PCA Canada, Scarborough, ON) and placed in a field cooler (Figure 2). The containers were placed directly on a layer of reusable ice substitute (Cyropak Corp., Vancouver, BC) which laid on each shelf of the field cooler (Figure 2). The cooler was a plywood shell lined with styrofoam insulation. Fruit were stored in the field cooler up to seven hours before being frozen at -40 °C in the plastic containers.

3.2.2.2 Physicochemical analyses

Ten fruit weight was determined by weighing three replicates of ten frozen fruit. The mean weight of the replicates was reported. Total solids content was determined as per AOAC method 920.151 (AOAC, 1995). Fifteen grams of fruit were dried in a vacuum oven at 70°C for 24 h. In 1997, moisture content of the whole fruit was reported as weight loss after drying 20 grams of fruit at 80°C in a vacuum air oven for 24 h. Percent pit was measured gravimetrically by separating fruit flesh from pit. In 1997, the flesh was manually separated from the pit. In all

other years, twenty gram samples were blended, in triplicate, with approximately 50 ml of 60°C distilled water for twenty seconds. The blended sample was strained and the flesh remaining on the pits was manually removed. Percent pit was reported as the weight of pit as per whole fruit weight. The estimated percent flesh was noted as the percent total solids content minus the percent pit.

Juice extracts for pH and soluble solids analyses were obtained by manually macerating 50 grams of choke cherry fruit flesh with 100 ml of distilled water (Figure 8). The sample was then centrifuged at 8500 rpm for ten minutes, and the resulting supernatant was utilized for pH and soluble solids analyses (Figures 8). To account for the effect of adding of water to the fruit prior to soluble solids determination, the solid solids content results were multiplied by a dilution factor of three. The pH was measured with a Model 420A benchtop pH meter (Orion Research Inc., Boston, MA) (Figure 4). Soluble solids content was determined by refractometer (Fisher Scientific, Nepean, ON) as per AOAC method 932.12 (AOAC, 1995) (Figure 4). The colour of the supernatant was also determined with a MiniScan XE colourimeter (Hunter Assoc., Reston, VA) (Figure 5). Juice extracts were prepared differently with fruit harvested in 1997. Equal weights of choke cherry fruit and water were boiled for 1 h and then the juice was decanted. To account for the effect of adding of water to the fruit prior to soluble solids determination, the solid solids content results were multiplied by a dilution factor of two.

Results from the 1998 harvest were statistically analyzed by analysis of variance and mean separation was accomplished by Tukey's Tests (SYSTAT 7.0, SPSS, Chicago, IL). For all other years, data were statistically analyzed using the general linear model procedure (PROC GLM) of Statistical Analysis Software Version 6.11 (SAS Institute, Gary, NY). Either the least significant difference (LSD) option or the probability of difference (PDIFF) option were used to determine significant differences among the fruit of the cultivars.

3.2.3 Black Currant

3.2.3.1 Sample collection

Black currant fruit of cultivars and unnamed selections were harvested at Yorkton, SK and Outlook, SK in 1997. In 1998, black currant fruit were harvested at four locations in Saskatchewan-Indian Head, Outlook, Saskatoon, and Yorkton. Black currant fruit samples were harvested at three locations in Saskatchewan-Outlook, Saskatoon, and Yorkton, in 1999 and 2000. Three plants per cultivar were harvested.

Black currant fruit were hand-picked. In 1997, samples were put into plastic bags and placed in styrofoam coolers containing a block of ice. After a transport time of up to seven hours, the fruit were then frozen in the plastic bags. In 1998, 1999, and 2000 fruit were put into plastic containers (25 x 19 x 8 cm) (Item Code PCA 9745, PCA Canada, Scarborough, ON) and placed in a field cooler (Figure 2). The containers were placed directly on a layer of reusable ice substitute (Cyropak Corp., Vancouver, BC) which laid on each shelf of the field cooler (Figure 2). The cooler was a plywood shell lined with styrofoam insulation. Fruit were stored in the field cooler up to seven hours before being frozen at -40 °C in the plastic containers.

3.2.3.2 Physicochemical analyses

Ten fruit weight was determined by weighing three replicates of ten frozen fruit. The mean weight of the replicates was reported. Total solids content was determined as per AOAC method 920.151 (AOAC, 1995). Fifteen grams of fruit were dried in a vacuum oven at 70°C for twenty-four hours. In 1997, moisture content of the whole fruit was reported as weight loss after drying 20 grams of fruit at 80°C in a vacuum oven for 24 h. Juice extracts for pH and soluble solids analyses were obtained by placing 50 grams of fruit in cheese cloth bags and manually squeezing out juice (Figure 9). The pH was measured with a Model 420A benchtop pH meter (Orion Research Inc., Boston, MA) (Figure 4). Soluble solids content was determined by refractometer (Fisher Scientific, Nepean, ON) as per AOAC method 932.12 (AOAC, 1995) (Figure 4). The colour of the juice extract was determined with a MiniScan XE colourimeter (Hunter Assoc., Reston, VA) (Figure 5). Samples were prepared in duplicate for titratable acidity analysis according to AOAC Method 920.149 (c) (AOAC International, 1995). However, 150 grams rather than 300 grams of frozen fruit were boiled for 1 hour and then centrifuged at 8500 rpm for 10 minutes. The supernatant was then made up to 1 L. The diluted supernatant was filtered through Whatman #4 filter paper and employed in the analysis as per AOAC Method 942.15 B (AOAC International, 1995) (Figure 10). The colour of the diluted supernatant was also determined with a MiniScan XE colourimeter (Hunter Assoc., Reston, VA) (Figure 5).

Results from the 1998 harvest were statistically analyzed by analysis of variance and mean separation was accomplished by Tukey's Tests (SYSTAT 7.0, SPSS, Chicago, IL). For all other years, data were statistically analyzed using the general linear model procedure (PROC GLM) of Statistical Analysis Software Version 6.11 (SAS Institute, Gary, NY). Either the least significant difference (LSD) option or the probability of difference (PDIFF) option were used to determine significant differences among the fruit of the cultivars.

3.2.3.3 Sensory Analysis of Black Currant Juice

An introduction to sensory evaluation techniques was planned for students in Introductory Horticulture 220.3. A series of panels in which black currant juices were compared with a commercial black currant concentrate of similar specifications was completed. Black currant juice was prepared from the fruit of Wellington, Boskoop Giant, and the selection 5-23-42, all harvested at Yorkton, SK in 1997.

Equal weights of fruit (600 grams) and distilled water (600 grams) were brought to a boil and simmered for 30 minutes, then cooled to 30°C. Distilled water was added to restore the mixture to its original weight and pectinase was added at the 0.1% level. The cooled mixture containing the enzyme was then refrigerated for 16 hours. After refrigeration, the mixture was strained through two layers of cheesecloth.The filtered juice, approximately 800 mls per selection, was transferred to a whirl pack bag and frozen for 48 to 72 hours prior to adjustment of titratable acidity and sugar content. Each juice preparation (Wellington, Boskoop Giant and 5-23-42) was divided into three sub-samples. The sub-samples were used to make juices of differing titratable acidity and sugar content. Sub-samples used for the first assessment did not

have titratable acidity adjusted, however, the soluble solids were adjusted to 50°Brix. The second time the juices were assessed, the titratable acidity and soluble solids were adjusted to be closer to the specifications of the commercial product, Ribena. A final assessment was planned (but the students were not available to complete the test) in which the soluble solids and titratable acidity were adjusted to match Ribena.

The sensory analysis study was a series of difference tests utilizing the triangle test. Panelists received a tray which contained three samples, two of which were identical and one which was different. Panelist were asked to select the different sample and mark its three-digit random number on the ballot. Samples were prepared by mixing 7 mL of room temperature juice with 28 mL of chilled soda water. The samples were placed in 6 oz. glasses coded with a random three-digit number. Trays included a glass of room temperature water and crackers so that panelists could cleanse their palette between samples.

3.2.4 Pin cherry

3.2.4.1 Sample collection

Pin cherry fruit were harvested at Saskatoon, SK and Indian Head, SK in 1997. In 1998, only the Saskatoon, SK site was harvested. In 1999 and 2000 pin cherry fruit were collected at Saskatoon, SK and Outlook, SK. Three plants per cultivar were harvested.

Pin cherry fruit were hand-picked. In 1997, samples were put into plastic bags and placed in styrofoam coolers containing a block of ice. After a transport time of up to seven hours, the fruit were then frozen in the plastic bags. In 1998, 1999, and 2000 fruit were put into plastic containers (25 x 19 x 8 cm) (Item Code PCA 9745, PCA Canada, Scarborough, ON) and placed in a field cooler (Figure 2). The containers were placed directly on a layer of reusable ice substitute (Cyropak Corp., Vancouver, BC) which laid on each shelf of the field cooler (Figure 2). The cooler was a plywood shell lined with styrofoam insulation. Fruit were stored in the field cooler up to seven hours before being frozen at -40 °C in the plastic containers.

3.2.4.2 Physicochemical analyses

Ten fruit weight was determined by weighing three replicates of ten frozen fruit. The mean weight of the replicates was reported. Total solids content was determined as per AOAC method 920.151 (AOAC, 1995). Ten grams of fruit were dried in a vacuum oven at 70 °C for twenty-four hours. In 1997, moisture content of the whole fruit was reported as weight loss after drying 20 grams of fruit at 80°C in a vacuum oven for 24 h. Percent pit was measured gravimetrically by separating fruit flesh from pit. In 1997, the flesh was manually separated from the pit. In all other years, 20 g samples were blended, in triplicate, for twenty seconds with approximately 50 ml of 60°C distilled water and 0.10 g of pectic enzyme (Wine Art Inc., Richmond Hill, ON). The blended sample was strained and flesh remaining on the pits was manually removed. Percent pit was reported as the weight of pit as per whole fruit weight. The estimated percent flesh was noted as the percent total solids content minus the percent pit. Juice

extracts for pH and soluble solids analyses were obtained by manually macerating 50 grams of fruit and decanting the liquid portion. The pH was measured with a Model 420A benchtop pH meter (Orion Research Inc., Boston, MA) (Figure 4). Soluble solids content was determined by refractometer (Fisher Scientific, Nepean, ON) as per AOAC method 932.12 (AOAC, 1995) (Figure 4).The colour of the juice extract was determined with a MiniScan XE colourimeter (Hunter Assoc., Reston, VA) (Figure 5).

Results from the 1998 harvest were statistically analyzed by analysis of variance and mean separation was accomplished by Tukey's Tests (SYSTAT 7.0, SPSS, Chicago, IL). For all other years, data were statistically analyzed using the general linear model procedure (PROC GLM) of Statistical Analysis Software Version 6.11 (SAS Institute, Gary, NY). Either the least significant difference (LSD) option or the probability of difference (PDIFF) option were used to determine significant differences among the fruit of the cultivars.

3.2.5 Highbush cranberry

3.2.5.1 Sample collection

In 1999, fruit of highbush cranberry cultivars were harvested at Indian Head, SK, Outlook, SK, and Saskatoon, SK. In 2000, highbush cranberry fruit were harvested at Outlook, SK and Saskatoon, SK. Three plants per cultivar were harvested.

Fruit were collected manually and with a hand held harvester (BEI, South Haven, MI) which vibrated causing fruit to fall into catch frames as the harvester was raked along plant branches (Figure 1). Fruit were put into plastic containers (25 x 19 x 8 cm) (Item Code PCA 9745, PCA Canada, Scarborough, ON) and placed in a field cooler (Figure 2). The containers were placed directly on a layer of reusable ice substitute (Cyropak Corp., Vancouver, BC) which laid on each shelf of the field cooler (Figure 2). The cooler was a plywood shell lined with styrofoam insulation. Fruit were stored in the field cooler up to seven hours before being frozen at -40 °C in the plastic containers.

3.2.5.2 Physicochemical analyses

Ten fruit weight was determined by weighing three replicates of ten frozen fruit. The mean weight of the replicates is reported. Total solids content was determined as per AOAC method 920.151 (AOAC, 1995). Ten grams of fruit was dried in a vacuum oven at 70 °C for twenty-four hours. Percent pit was measured gravimetrically by separating fruit flesh from pit. Percent pit was measured gravimetrically by separating fruit flesh from pit. Twenty gram samples were blended, in triplicate, for twenty seconds with approximately 50 ml of 60°C distilled water and 0.10 g of pectic enzyme (Wine Art Inc., Richmond Hill, ON). The blended sample was strained and flesh remaining on the pits was manually removed. Percent pit is reported as the weight of pit as per whole fruit weight. The estimated percent flesh was noted as the percent total solids content minus the percent pit. Juice extracts for pH and soluble solids analyses were obtained by manually macerating 50 grams of fruit and decanting the liquid

portion. The pH was measured with a Model 420A benchtop pH meter (Orion Research Inc., Boston, MA) (Figure 4). Soluble solids content was determined by refractometer (Fisher Scientific, Nepean, ON) as per AOAC method 932.12 (AOAC, 1995) (Figure 4).The colour of the juice extract was determined with a MiniScan XE colourimeter (Hunter Assoc., Reston, VA) (Figure 5).

3.3 Results and Discussion

3.3.1 Saskatoon

3.3.1.1 Physicochemical analyses

1997

The physicochemical characteristics of saskatoon fruit from the 1997 harvest are presented in Table 4. Mean pH, soluble solids content, and hue angle of the three replicated plants per site for each cultivar is stated, as well as the mean values of all fruit samples collected for each cultivar. Fruit of Martin, Nelson, Par90TRS, and Quaker exhibited the minimum pH, 3.7, among 1997 samples. The maximum pH, 4.2, was that of Forestburg. Soluble solids ranged from 13.6 °Brix for the fruit of Quaker and 19.4 °Brix for that of Pembina. An enormous amount of variability in hue angle was demonstrated within the replicates from one location. Hue angle is an indication of whether a colour tends towards red, yellow, blue, or green. Hue angles ranged from 0.0 ° for the fruit of Pembina, indicating a red colour, to -12.7 ° for the fruit of Success, indicating a more purple colour. However, standard error of replicate means within a cultivar from a particular site was as high as 38.02. Thus, it was difficult to ascertain colour differences among saskatoon fruit samples. Statistical analysis of the data was performed to discover any significant differences among cultivar fruit characteristics. Unfortunately due to insufficient amounts or to the absence of samples, the cultivars Pasture, Pembina, Quaker, and Nelson were excluded, as were the locations of Hudson Bay and Makwa,. Statistical analysis revealed Martin and Par90TRS to have significantly lower fruit pH, 3.7, than most other cultivars (Table 5). There were no significant differences among soluble solids contents and hue angles (Table 5).

1998

Table 6 shows the results of physicochemical analyses of saskatoon fruit harvested in 1998.The weight of ten fruit ranged from 7.7 to 16.2 grams for the fruit of Success and Martin, respectively. The fruit of Pembina was found to have the most total solids, 30.8%, followed by Nelson with 26.5%, and Thiessen had the least amount of total solids, 20.8%. The fruit of Nelson had the lowest pH, 3.6, and that of Forestburg, Parkhill, PearsonII, and Smoky were highest at 4.2. Nelson also exhibited the greatest soluble solids content, 19.6 °Brix. The fruit of Quaker had the minimum soluble solids content, 13.8 °Brix. An improved method was used to measure hue angle on the 1998 samples. Hue angles ranged from -0.6 ° to -28.6 ° for the fruit of Pasture and Success, respectively. Variability among replicates was reduced, yet standard error of replicate means from a single location still exceeded 10 in many cases. This variation may be due to fruit

being in heterogenous stages of maturity when harvested. Although all fruits selected for colour analysis were visually assessed as equally mature and ripe, the colourimeter may have detected differences unnoticed by the naked eye. Differences in the waxy cuticle layer surrounding the fruits may also contribute to the variability in colour as measured by a colourimeter. However, it was most likely the rounded surfaces of the fruit that caused the variability. Colourimeters operate on the basis of light reflectance. The uneven surface of fruit in the petri dish allows for light to be reflected in a multitude of angles adding to the variability. It is suggested that future colour analyses utilize the naked eye to identify any noticeable colour differences in ripe, mature fruit. It is differences readily noticed by the naked eye which will be relevant in terms of marketing fruit. The maturity class index for saskatoon fruit developed by Rogiers and Knowles (1997) could readily be employed as a benchmark for ripe, mature saskatoon fruit colour. Assessing the colour of juice extracts from saskatoon fruit may also offer some insight into cultivar variances.

Statistical analyses of data from the samples harvested in 1998 excluded the cultivars Pasture, Pembina, and Quaker, and the locations Hudson Bay and Makwa due to insufficient amounts or absence of samples. Thiessen, Martin, and Par90TRS were found to produce fruit with significantly greater ten fruit weight than other cultivars (Table 7). Yet the fruit of Thiessen had the minimum total solids content, 20.3% (Table 7). Thus, the increased fruit weight can be attributed to moisture. Some cultivars appear to store more moisture in their fruit than others. The fruit of Nelson had significantly higher total solids content, 26.5%, than the fruit of the other cultivars and also had significantly higher soluble solids, 19.6 °Brix (Table 7). Considering the ten fruit weight of Nelson, 10.6 grams, it is expected levels components such as anthocyanins and organic acids will appear high in the fruit of Nelson compared to other cultivars; just as the levels of such components will appear low in Thiessen's fruit due the dilution effect of more moisture being present. Note that the soluble solids content of fruit of Thiessen was 14.3 ° Brix, one of the lowest values (Table 7). As already discussed, variability of colour data introduces difficulty when comparing cultivars. Statistically, the fruit of Bluff, Regent, and Success had significantly different hue angles; -20.2 °, -23.6 °, and -28.6 °, respectively, than PearsonII, -6.2 °. Thus, the fruit of PearsonII had more of purple or blue hue than the others, which would be considered more red than purple. However, as mentioned differences are likely not noticeable with the naked eye.

Fruit characteristics of unnamed saskatoon selections harvested in 1998 are shown in Table 8. Ten fruit weight ranged from 9.5 to 4.1 grams for fruit of Row 4 #10 and Row 15 #31, respectively. Row 4 #10 also had fruit with the minimum total solids content, 23.1%. The pH ranged from 3.6 for fruit of Row 8 #39 to 4.0 for that of Row 6 #5. The fruit of Row 8 #39 also had the greatest soluble solids content, 23.2 °Brix. In general, soluble solid contents of the selections were high in comparison to that of the named cultivars harvested in 1998 (Table 6). This data will supplement the agronomic information available on the selections and aid in choosing selections for further development.

1999

Characteristics of saskatoon fruit harvested in 1999 are presented in Table 9 and statistical comparison of this data is shown in Table 10. The cultivar Pasture was excluded from

the statistical analysis as it was not present at the Moon Lake location. Fruit of the cultivars Thiessen, Martin, and Par90TRS had significantly higher ten fruit weight than the fruit of other cultivars. Compared to the fruit of other cultivars, significantly greater total solids contents were found in the fruit of the cultivars Pembina, Northline, and Nelson. The pHs of the fruit ranged from 3.7 to 4.2 with the fruit of the cultivar PearsonII having a significantly greater pH than the fruit of the other cultivars.

Fruit of the cultivar Nelson had the greatest soluble solids content and the fruit of the cultivar Honeywood had the lowest, 17.2°Brix and 13.0°Brix, respectively. Titratable acidity analysis revealed the fruit of the cultivar Pembina to have a significantly greater acid content than the fruit of the other cultivars and the fruit of the cultivars Forestburg, Honeywood, and Regent to have significantly lower titratable acidity values. The titratable acidity results were similar to those found by Green and Mazza (1986) for the fruit of the cultivars Regent, Smoky, and Northline. However, the values noted by Green and Mazza (1986) for fruit of the cultivar Honeywood is somewhat lower than the values in Table 10. Colour assessment of saskatoon fruit harvested in 1999 showed the fruit of the cultivars Honeywood and Success to be significantly more red and the fruit of the cultivar Buffalo to be significantly more purple than fruit of the other cultivars (Table 10 and Figure 11). Fruit of the cultivar Thiessen was the most vivid as indicated by the chroma value. Note that the colour of the juice extracts was determined rather than the colour of the fruit exterior. Due to the uneven contours of the fruit, exterior colour measurements were far too variable within the fruit of one cultivar to allow comparison with the fruit of other cultivars. Colour analysis of the fruit extracts yielded consistent results which allowed for comparison of colour among cultivars. The colour of the fruit extracts will be directly applicable to final products produced from the fruits' juice and to products in where the juice leaches out of the fruit.

The amount of juice extracted from 25 g of saskatoon fruit harvest in 1999 is shown in Table 11. Statistical analysis of this data is shown in Table12. The maximum amount of juice extracted was 13.8 mL for the fruit of the cultivar Thiessen and the minimum was 11.4 mL for the fruit of the cultivar Success. The fruit of the cultivar Thiessen may have yielded more juice due to its generally greater ten fruit weight and lower total solids content.

Results of the anthocyanin analysis by HPLC are shown in Table 13 and an example of a chromatogram is shown in Figure 12. Four peaks were found at 520 nm. The first was identinfied as cyanidin-3-galactoside and the second as cyanidin-3-glucoside. The remaining two peaks were not identified. The retention times were 9.7 to 10.1 minutes for cyanidin-3-galactoside, 10.8 to 11.2 for cyanidin-3-glucoside, 11.5 to 11.9 for unknown 1, and 14.2 to 14.6 for unknown 2. Cyanidin-3-galactoside consistently accounted for the largest percent of total peak area followed by cyanidin-3-glucoside, then unknown1, and lastly unknown 2. Amounts of cyanidin-3-galactoside ranged from 173.9 μg/g for the fruit of the cultivar Pembina to 489.5 μg/g for the fruit of the cultivar Northline. The greatest variation in amount, as noted by the standard error, was seen in cyanidin-3-galactoside content. Statistical analysis of the anthocyanin contents is presented in Table 14. Cyanidin-3-galactoside content of the fruit of the cultivar Northline was significantly greater than that of all other cultivars except for the fruit of the cultivar Nelson. Fruit of the cultivars Forestburg and Pembina had significantly lower cyanidin-3-galactoside content compared to the fruit of most other cultivars. Fruit of the cultivars Northline,

Honeywood, Pembina, and Smoky had significantly lower cyanidin-3-glucoside contents than the fruit of most other cultivars. The fruit of the cultivars Buffalo and Nelson were significantly higher in cyanidin-3-glucoside content compared to the fruit of other cultivars. Total anthocyanin content of the fruit of the cultivar Nelson was significantly greater than that of the fruit of the other cultivars, excluding the fruit of the cultivars Bluff and Northline. The total anthocyanin contents were lower than those reported by Green and Mazza (1986) for the fruit of the cultivars Honeywood, Regent, and Smoky. The discrepancy was likely due to differences in methodology. Green and Mazza (1986) employed the pH differential method of Fuleki and Francis (1968) to determine total anthocyanin content. It was expected that the spectrophotometric method of Fuleki and Francis (1968) would produce larger values due to the absorbance of other compounds and the use of only one molar extinction coefficient. The HPLC method employed in this study was more accurate. Although, total anthocyanin contents may be low because the absorbance of anthocyanins at wavelengths other than 520 nm was not determined. However, it is still expected that total anthocyanin contents determined by HPLC will be less than those determined by spectrophotometric methodology.

2000

Table 15 shows the results of physicochemical analyses of saskatoon fruit harvested in 2000 and statistical analysis of this data is presented in Table 16. The maximum ten fruit weight was that of the fruit of the cultivar Martin, 16.9 g, which was significantly greater than the fruit of all other cultivars. The total solids content of the fruit of the cultivar Pembina was significantly greater than the fruit of all other cultivars and the fruit of the cultivar Quaker was significantly lower in total solids content. Fruit of the cultivar Pembina and Quaker also had the highest and lowest soluble solids contents, respectively. The pHs of the fruit ranged from 3.7 to 4.2. Fruit of the cultivar Nelson had significantly greater titratable acidity compared to the other cultivars, while the fruit of the cultivars Regent and Success had significantly lower values. Hue angles of the juice extracts from saskatoon fruit were all very similar in 2000 (Table 15 and Figure 13). Chroma values indicate that the fruit of the cultivar Martin were the most vivid in colour.

Anthocyanin composition and content of the fruit of saskatoon cultivars harvested in 2000 at Saskatoon are presented in Table 17. Four peaks were found at 520 nm. The first was identified as cyanidin-3-galactoside and the second as cyanidin-3-glucoside. The remaining two peaks were not identified. The retention times were 9.8 to 10.0 minutes for cyanidin-3-galactoside, 10.8 to 11.0 for cyanidin-3-glucoside, 11.5 to 11.7 for unknown 1, and 14.2 to 14.4 for unknown 2. Cyanidin-3-galactoside consistently accounted for the largest percent of total peak area followed by cyanidin-3-glucoside, then unknown1, and lastly unknown 2. Amounts of cyanidin-3-galactoside ranged from 203.4 μg/g for the fruit of the cultivar Forestburg to 540.0 μg/g for the fruit of the cultivar Nelson. The greatest variation in amount, as noted by the standard error, was seen in cyanidin-3-galactoside content. Statistical analysis of the anthocyanin contents is presented in Table 18. Cyanidin-3-galactoside contents of the fruits of the cultivars Nelson, Northline, and Bluff were significantly greater than those of all other cultivars. Fruit of the cultivars Nelson and Bluff had a significantly higher cyanidin-3-galactoside content compared to the fruit of other cultivars. Fruit of the cultivars Northline and Success had significantly lower cyanidin-3-glucoside contents than the fruit of most other cultivars. Total

anthocyanin content of the fruit of the cultivars Nelson and Bluff was significantly greater than that of the fruit of the other cultivars. The total anthocyanin contents were lower than those reported by Green and Mazza (1986) for the fruit of the cultivars Honeywood, Regent, and Smoky. The discrepancy was likely due to differences in methodology. Green and Mazza (1986) employed the pH differential method of Fuleki and Francis (1968) to determine total anthocyanin content. It was expected that the spectrophotometric method of Fuleki and Francis (1968) would produce larger values due to the absorbance of other compounds and the use of only one molar extinction coefficient. The HPLC method employed in this study was more accurate, although, total anthocyanin contents may be low because the absorbance of anthocyanins at wavelengths other than 520 nm were not determined. However, it is still expected that total anthocyanin contents determined by HPLC will be less than those determined by spectrophotometric methodology.

Summary

The maximum ten fruit weight recorded was for the fruit of the cultivar Martin harvested in 2000, 16.9 g, and the minimum was for the fruit of the cultivar Success harvested in 2000, 7.1 g. Fruit of the cultivars Martin, Thiessen, and Martin always had the largest ten fruit weights and the fruit of the cultivars Success and Bluff were typically lowest in ten fruit weight. The greatest, total solids content was found in the fruit of the cultivar Pembina harvested in 2000, 28.2%, and the minimum was exhibited by the fruit of the cultivars PearsonII and Forestburg harvested in 1999, 19.3%. Fruit of the cultivars Pembina and Nelson often had the highest percent total solids. The pH was very consistent among cultivars from year to year. The pHs of the fruit ranged from 3.6 to 4.2 over the years analysed. The fruit of the cultivar Nelson usually had a high soluble solids content. The maximum soluble solids content recorded was for the fruit of the cultivar Pembina harvested in 2000, 21.4°Brix, and the minimum recorded was for the fruit of the cultivar Honeywood harvested in 1999, 13.0°Brix. Generally, soluble solids contents were elevated in 2000 compared to other years. Environmental influences such as lower rainfall may have been a factor which elevated soluble solids contents. Colour comparison are difficult to ascertain due to changes in methodology. However, the same methodology was employed for samples harvested in 1999 and 2000. For the fruit of each cultivar, the hue angles and chroma values were very similar in 1999 and 2000.

Saskatoon fruit harvested in 1999 and 2000 were subjected to total titratable acidity and anthocyanin analyses. The maximum total titratable acidity value was found for the fruit of the cultivar Nelson harvested in 2000, 0.64% malic acid, and the minimum was 0.28% malic acid for the fruit of the cultivars Smoky and Success harvested in 1999. Fruit of the cultivars Nelson, Bluff, and Northline had the largest total anthocyanin contents in both 1999 and 2000, and also had the greatest amount of cyanidin-3-galactoside. Fruit of the cultivar Forestburg had the lowest total anthocyanin content and lowest cyanidin-3-galactoside content. It appears larger cyanidin-3-galactoside content indicates greater total anthocyanin content. Fruit of the the cultivars Nelson, Buffalo, and Bluff had the highest contents of cyanidin-3-galactoside and of the two unidentified anthocyanins.

3.3.1.2 Sensory evaluation of saskatoon fruit as pie filling

Results of the sensory analysis of saskatoon fruit pie fillings are presented in Table 19 and Figures 14 to 19. Pie fillings made from fruit of fourteen different saskatoon cultivars were evaluated. In the following discussion of the sensory analysis, cultivar names refer to the pie filling prepared from the fruit of that cultivar. As shown in Table 19, Nelson was rated the most tart, 3.6, and least sweet, 6.1, with the most intense flavour, 3.5, and also had the least pleasant saskatoon flavour, 6.9. The tartness of Nelson was significantly greater than all other varieties except Quaker, 3.7, Par90TRS, 4.1, Northline, 4.1, and Pasture, 4.1. Success was the least tart, 5.8, but was not significantly different from Bluff, 5.2, Honeywood, 5.7, Pembina, 5.1, Regent, 5.4, or Smoky, 5.7. Thus, these five cultivars are somewhat tarter than all others. The sweetness of Nelson was significantly less than seven other varieties (Table 19). The cultivar considered most sweet was Regent, 4.8.

The flavour of Nelson was significantly more intense, 3.5, than all other cultivars except Northline, 4.1. The weakest or least intense flavour was displayed by Smoky, 5.8, which was significantly less than all others except, Honeywood, 5.3. Thus, Smoky and Honeywood were weakest in flavour, while Nelson and Northline were the strongest. Note that panelists were instructed to rate flavour intensity without regard for whether the flavour was desirable or not. Considering panelist comments and flavour acceptance ratings, the intense flavour of Nelson and Northline appears undesirable. Several panelists described Nelson's flavour as "musty" and one panelist simply commented "bla!". Nelson was found to have the least pleasant saskatoon flavour, 6.9, which was significantly less pleasant than all others except Northline, 6.3, and Pembina, 5.9. The maximum response for flavour acceptability was Thiessen, 5.2. Since Thiessen was the reference sample, it was expected to be rated nearly equal to the reference (5.0) and it was. Thiessen was only significantly different than Nelson, 6.9, and Northline, 6.3. This suggests the flavours of all other cultivars were not objectionable and were as pleasing as the reference.

Seediness responses ranged from 4.2 for Success to 5.1 for PAR90TRS. Success was significantly more seedy than five other cultivars, and PAR90TRS was significantly less seedy than five cultivars (Table 19). These results suggest seediness was similar among varieties, or it was a difficult characteristic for panelists to assess. In regards to firmness, there were three distinct groupings of cultivars which were significantly different from each other. Buffalo, 3.2, was significantly firmer than all other varieties. Secondly, Nelson, 4.0, Northline, 4.0, and Regent, 4.0, were significantly less firm than Buffalo yet significantly firmer than the third group. The third group contained Bluff, 4.9, Honeywood, 4.8, Martin, 4.8, PAR90TRS, 4.8, Pasture, 5.0, Pembina, 4.8, Quaker, 4.7, Smoky, 4.8, Success 4.7, and Thiessen, 4.7. This group was significantly less firm than the others. However, there was no drastic loss of structural integrity in any of the cultivars.

To assess how consistent panelists were in rating samples, once every three sessions a reference was included as a sample. Statistical analysis revealed that the panelists rated these hidden reference samples quite consistently. There were only one or two extreme outliers for

tartness, sweetness, and flavour intensity over the entire study. There were no significant differences among firmness and flavour acceptability ratings. Thus, panelists were completely consistent in rating firmness and flavour acceptability.

In summary of the sensory study, Nelson and Northline were among the most tart, least sweet, and most flavour intense varieties. They were also found to have the least pleasant flavour of all cultivars. The variety with the most pleasant flavour was Thiessen, which was not significantly different from most varieties. Seediness maybe a difficult characteristic for sensory panelists to judge. Firmness differences were easily distinguishable among cultivars, but all appeared to be of acceptable firmness. The panelists' consistent rating of hidden reference samples validates the data acquired.

3.3.1.3 Lyophilization/freeze-drying of saskatoon fruit

Saskatoon fruit subjected to freeze-drying are shown in Figure 20. Visual characteristics of the fruit remained virtually unchanged for first two days of freeze-drying. Then indentations on the fruit surface were noted. By the fourth and fifth days the fruit appeared shriveled and were surrounded by a sticky liquid leached from the fruit. Weight loss of the fruit was approximately 80%. Freeze-drying of other fruits, such as strawberries, produces a final product in which the original physical structure of the fruit is not compromised. The fruit generally do not shrivel, thus maintaining their external appearance although loss of colour is usually apparent. The inherent waxy covering of saskatoon fruit may have prevented moisture from migrating out of the fruit. The presence of seeds may have also hindered moisture leaving the fruit. It is possible that physical alteration of the fruit, such as blending or mashing, prior to freeze-drying would aid in moisture removal. However, the solids content in the liquid portion of the fruit (i.e. soluble solids) may be interfering with moisture removal as evidenced by the sticky exudate around the fruit. These results when attempting to freeze-dry saskatoon fruit were also experienced by R. Knowles (1998). It does not appear that freeze-drying is applicable to whole saskatoon fruit as a preparative method for chemical analyses nor as a value-added process.

3.3.2 Choke Cherry

3.3.2.1 Physicochemical analyses

1997

Choke cherry samples collected from three sites in August 1997 were analysed for moisture, soluble solids, pH, titratable acidity, pit to flesh ratio (expressed as % pit) and average fruit weight. The results of these analyses are presented in Table 20. Statistical analysis was not completed on the data. The data indicated that the moisture content ranged from 58.4 to 70.6%, soluble solids from 13.0 to 20.8°Brix, pH from 3.81 to 4.52, titratable acidity from 0.53 to 1.38%, % pit (w/w) ranged from 16.2 to 30.2%, and weight per fruit ranged from 0.39 grams to 0.89 grams. Some of the variability among cultivars and selections may be due to not harvesting

all fruit at the optimum stage of fruit maturity. Selections with low pit to flesh ratio may be desirable in order to reduce processing waste.

1998

The characteristics of choke cherry fruit harvested in 1998 are presented in Table 21. The weight of ten fruit varied from 3.1 to 7.9 grams for selection 16-8 and the cultivar Lee, respectively. Lee however, also had fruit with the least percent pit, 10.7%, and greatest estimated percent flesh, 21.3%. It is highly desirable to have a large ten fruit weight and low percent pit, as Lee does. This reduces the amount of waste product from the fruit. Increased amounts of the usable flesh portion will improve the marketability of the fruit. Fruit of Garrington had the highest pH, 4.3, and that of selection 9-15 had the lowest, 3.7. Typically, pectin gelling requires decreased pH values. Thus, processing applications involving gelling may benefit from lower pHs, since less acidulant will be required. However, it is highly desirable to examine the pectin content of choke cherry fruit before recommending particular cultivars or selections for such processing applications. Soluble solids content ranged from 16.2 to 22.5 °Brix for the fruit of selections 9-78 and 3-11, respectively. Fruit characteristics of selections will be used in conjunction with agronomic data to choose suitable candidates for further development. Selections such as 3-11, 14-14, 16-8, and 17-69 are likely not suitable due to their large percent pit values.

Statistical analysis of the data from Garrington and the Boughen Yellow cultivar showed that Garrington's fruit had a significantly higher pH. No other significant differences existed between the two cultivars. Because fruit of the Boughen Yellow cultivar are yellow in colour, once the physical structure of the Boughen Yellow fruit was compromised. [Very noticeable browning of the tissue and juice extract occurs.] This would be considered problematic in most food processing situations. Extra costs may be incurred to prevent the browning, thus decreasing profit margins. Lee was not included in the statistical analyses due to missing data from the Saskatoon location.

1999

The characteristics of choke cherry fruit harvested in 1999 are presented in Table 22. The weight of ten fruit varied from 6.5 to 9.3 grams for fruit of the cultivars Boughen Yellow from Outlook and of Robert from Saskatoon, respectively. Fruit of the cultivar Boughen Yellow from Saskatoon had the minimum total solids, 30.9 %, the maximum pit, 15.0 %, and thereby the least estimated percent flesh, 15.9 %. Fruit of the cultivar Copper Shubert had the greatest total solids content, 37.2 %, and the greatest estimated percent flesh, 24.9 %. The least percent pit value was obtained for fruit of the cultivar Goertz, 9.6 %. A combination of large ten fruit weight and large total solids content with low percent pit values is highly desirable for processing applications. The amount of waste generated by the pit would be minimized while the amount of useable flesh would be maximized. Fruit of the cultivar Boughen Yellow does not appear particularly well suited to processing applications given its somewhat low ten fruit weight, low total solids content, and large percent pit. It was also observed that the flesh of the fruit of the cultivar Boughen Yellow rapidly browned when macerated. When processing the fruit of the cultivar Boughen Yellow, browning concerns may need to be addressed. Fruit of the cultivar Copper

Shubert may be appropriate for further processing as they had a high estimated percent flesh. Fruit of all other cultivars appeared to have similar amounts of useable fruit flesh as demonstrated by the estimated percent flesh values (Table 22).

The pH of choke cherry fruit ranged from 3.8 for fruit of the cultivar Boughen Yellow from Outlook to 4.3 for the fruit of the cultivars Garrington and Goertz from Saskatoon. Fruit of the cultivar Boughen Yellow from Saskatoon had the least soluble solids content, 12.1°Brix. The colour of the diluted choke cherry juice extracts had L values of 24.5 for the fruit of the cultivar Garrington from Saskatoon to 51.9 for the fruit of the cultivar Boughen Yellow from Outlook. Hue angles ranged from 91.7° for fruit of the cultivar Boughen Yellow from Outlook to 38.7° for the fruit of the cultivar Garrington from Saskatoon. Juice extracts of the fruit of the cultivar Boughen Yellow were visually assessed as being a pale yellow and were therefore expected to have a larger L values and hue angles than the fruit of other cultivars. The distribution of the hue angles and chroma of the choke cherry juice extracts of fruit of the cultivars Garrington, Lee, and Boughen Yellow are represented in Figure 21. The general grouping around 90° suggests that the juice extracts of fruit of the cultivar Lee were similar in colour to those of Boughen Yellow. However, the extracts of fruit of the cultivar Lee were visually assessed as being pale red-pink and those of Boughen Yellow pale yellow. According to the chroma values and L values generated by the colourimeter, these extracts were grayish in colour. It is possible that the the diluted juice extracts lacked the vividness needed for proper colour assessment by the colourimeter. It would be desirable in the future to measure the colour of undiluted choke cherry juice extracts.

Statistical analysis of all data collected for the fruit of the cultivars Garrington, Lee, and Boughen Yellow showed that the fruit of the cultivar Boughen Yellow had significantly lower total solids, estimated percent flesh, and soluble solids content than the fruit of the other cultivars (Table 23). The fruit of the cultivars Lee and Boughen Yellow were significantly lighter (lower L values) than the fruit of the cultivar Garrington. Hue angles of the fruit of all three cultivars were significantly different from each other.

2000

Fruit characteristics of the choke cherry cultivars harvested in 2000 are presented in Table 24. Ten fruit weight ranged from 6.5 g for the fruit of the cultivars Boughen Yellow and Mission Red to 7.9 g for the fruit of the cultivars Lee and Robert, all harvested at Saskatoon. Fruit of the cultivar Mini Shubert had the greatest total solids content, 42.0%. Fruit of the cultivar Boughen Yellow had the greatest percent pit and the fruit of the cultivar Goertz had the least. The largest estimated percent flesh was exhibited by fruit of the cultivar Mini Shubert, as would be expected due to its large total solids content. The fruit of the cultivar Mini Shubert also had the greatest soluble solids content. Colour analysis of the choke cherry fruit juice extracts indicated Boughen Yellow to be the lightest (highest L value), most yellow (highest hue angle), and least vivid (lowest chroma value) in colour (Table 24 and Figure 22). The same problem as noted in 1999 samples may have influenced colour results. The dilution of the juice extract may have yielded samples without vividness needed for proper colour assessment by the colourimeter

Statistical analysis of the fruit of the cultivars Boughen Yellow, Garrington, and Lee harvested at Outlook and Saskatoon in 2000 is shown in Table 25. Fruit of the cultivar Boughen Yellow had significantly greater total solids content, percent pit, estimated percent flesh, and pH than the fruit of the cultivars Garrington and Lee. There were no significant differences in soluble solids contents. The colour of the juice extracts from the fruit of the cultivar Boughen Yellow was significantly more yellow and less vivid than that of the fruit of the other cultivars.

Summary

The maximum ten fruit weight was that of the fruit of the cultivar Goertz harvested in 2000, 9.6 g. The fruit of the cultivar Boughen Yellow in 1998 had the lowest ten fruit weight, 6.4 g. There were many unnamed selections harvested in 1998 which had ten fruit weight below 5.0 g. The fruit of the cultivar Lee often had high ten fruit weight. The total solids content ranged from 42.0% for the fruit of the cultivar Mini Shubert harvested in 2000 to 30.9% for the fruit of the cultivars Boughen Yellow and Lee harvested in 1999 and 2000, respectively. Typically, the fruit of the cultivar Boughen Yellow had the largest percent pit. In 1999 and 2000, fruit of the cultivar Goertz had the least percent pit among cultivars analysed. The estimated percent flesh was lowest for the fruit of the cultivar Boughen Yellow in both 1999 and 2000. The pH of the choke cherry fruit was consistent from year to year and ranged overall from 3.7 to 4.3. The maximum soluble solids content was recorded for the fruit of the cultivar Mini Shubert harvested in 2000, 26.4°Brix. The minimum soluble solids content was found in the fruit of the cultivar Boughen Yellow in 1999, 12.1°Brix. It appeared that all choke cherry fruit harvested in 1997 and 1999 generally had lower soluble solids content than the choke cherry fruit harvested in 1998 and 2000. All fruit seemed to have similar hue angles in 1999 and 2000. However, colour assessment may have been skewed due to how diluted the samples were.

3.3.3 Black Currant

3.3.3.1 Physicochemical analyses

1997

Black currants were harvested at Yorkton and Outlook; the samples included named varieties and numbered selections. Harvested fruit were analysed for pH, soluble solids, moisture, and 10 berry weight, if a sufficient quantity was available. The results of the analyses and statistical analyses are presented in Table 26. At both sites, the fruit of the cultivar Consort was the smallest fruit harvested, it was significantly smaller than fruit of the cultivar Wellington, but did not significantly differ from the fruit of any other cultivars. Boskoop Giant, at 13.8°Brix was significantly lower in soluble solids from numbered selection 5-23-42 (18.0°Brix) but no other selections were different from either Boskoop Giant or 5-23-42. Boskoop Giant had a significantly lower pH than all the numbered selections, but didn't differ significantly from the other named selections. Wellington was very similar to Boskoop Giant; it differed from the all the numbered selections except 25-23-23 and the pH was not significantly different than that of the named cultivars. Wellington was a large fruit with mid range acidity and a low pH that seemed acceptable in taste panel analysis when prepared as a juice concentrate.

1998

Fruit of five black currant cultivars and three selections were analysed (Table 27).The sample of Consort from Outlook exhibited the lowest ten fruit weight, 2.6 grams, and the highest total solids, 26.3%. Selection 25-23-23 from Yorkton had the greatest ten fruit weight, 13.2 grams, and the lowest total solids, 18.7%. These results strongly suggest that moisture is the primary determinant of fruit weight. Some cultivars and selections may inherently store more moisture in their fruit, or certain locations may simply receive more rainfall thus providing more moisture to the plants. In several cases the fruit from Yorkton appeared to have larger ten fruit weight than other locations indicating greater rainfall at this location. Other agronomic factors and management practices may also play a role in site variations. The fruit of Boskoop Giant, Consort, and Wellington all had the minimum pH, 2.9. The fruit of selection 5-23-23 had the maximum pH, 3.3. As expected, the greatest soluble solids content was that of Consort from Outlook, 18.5 °Brix. This was expected due to the concentrating effect of a low ten fruit weight and high total solid content. And also as expected, selection 25-23-23 had the minimum soluble solids content, 13.4 °Brix. The diluting effect of the excess moisture as indicated by the large ten fruit weight and low total solids content suggested a low soluble solids content in this selection.

The colour of the juice extract prepared for titratable acidity was determined, and as indicated by the hue angle, juices were red in colour. All samples produced juice extracts of similar colour, as the population standard deviation was only 0.75. The flat smooth surface of the juice decreased instrument variability which was discussed in regards to colour analysis of saskatoon fruit. Total titratable acidity ranged from 3.55 % citric acid for the fruit of selection 25-23-23 to 4.99 % citric acid for that of Consort from Outlook. Again the diluting and concentrating effect of moisture content was evident. The data for total titratable acidity results are comparable to those of Blom and Skrede (1984). They analysed four black currant cultivars harvested in two years and found a range of 3.1 to 4.6 % citric acid. The results in shown in Table 12 are slightly higher on average. To establish these black currant cultivars and selections as having greater acid content, data from subsequent years is required.

1999

The fruit of eight black currant cultivars and three selections were analyzed (Table 28). Ten fruit weight ranged from 15.3 g for the fruit of the selection 5-23-42 from Saskatoon to 6.7 g for the fruit of the cultivar Consort from Outlook. In several cases, fruit from Saskatoon had higher ten fruit weight than fruit harvested from other locations. This may be due to environmental influences and/or agronomic practices. Fruit of the cultivar Consort from Saskatoon also had the largest total solids content 26.1 % citric acid. Fruit of the cultivar Wellington exhibited the lowest pH, 2.8, and fruit of the selection 5-24-9 had the highest pH, 3.2. Soluble solids content ranged from13.3°Brix for the fruit of selection 5-24-9 from Saskatoon to 17.0°Brix for the fruit of the cultivar Willoughby from Outlook. There was no apparent association among ten fruit weight, total solids, and soluble solids. Fruit of the cultivar Crusader had the greatest titratable acidity, 4.21 % citric acid, and the fruit of the selection 5-23-42 from Yorkton had the least, 2.90 % citric acid. These results are somewhat lower than the data

obtained by Blom and Skrede (1984) which showed the fruit of four black currant cultivars to have a titratable acidities of 3.1 to 4.6 % citric acid.

The colour of the juice extracts of the black currant fruit are shown in Figure 23. All extracts had similar hue angles but differed in vividness. According to the L values, extracts of the fruit of the cultivars Consort, Cornet, and Crusader were lighter compared to the fruit of other cultivars (Table 28). The L values also show the juice extracts were darker than the diluted supernatants of the boiled fruit. It was expected the colour would fade with dilution. Hue angles indicated the colour of the diluted supernatants were less purplish and more reddish compared to the juice extracts.

Results of the statistical analysis of data collected for the fruit of the selections 25-23-23, 5-23-42, and 5-24-9 and for the cultivars Boskoop Giant, Consort, Magnus, Topsy, Wellington, and Willoughby harvested from Saskatoon, SK and Outlook, SK are shown in Table 29. Fruit of the cultivars Boskoop Giant, Consort, Magnus, Topsy, and Willoughby had significantly lower ten fruit weight than the fruit of the other selections and cultivars. The pH of fruit of the cultivars Consort and Wellington were significantly lower compared to the fruit of the other selections and cultivars; The fruit of the selection 5-24-9 had a significantly higher pH compared to the fruit of the other selections and cultivars. The titratable acidity of the fruit of the selections was significantly lower than that of the fruit of the cultivars with the exception of the fruit of the cultivar Boskoop Giant. There were no significant differences among the total solids, soluble solids, L values, and hue angles of the fruit of the selections and cultivars statistically analyzed.

2000

Fruit characteristics of black currant cultivars harvested in 2000 are shown in Table 30. Fruit of the cultivar Consort harvested at Outlook had the lowest ten fruit weight and fruit of the cultivar Wellington harvested at Yorkton had the highest, 4.5 and 11.4 g, respectively. Total solids contents ranged from 19.6 % citric acid for the fruit of the cultivars Boskoop Giant harvested at Saskatoon and Wellington harvested at Yorkton to 24.8 % citric acid for the fruit of the cultivar Consort harvested at Outlook. The pH of fruit of all cultivars was very similar. Fruit of the cultivar Wellington exhibited both the maximum and minimum soluble solids content, depending on location of harvest. Total titratable acidity ranged from 3.1% citric acid as citric acid for fruit of the selection 5-23-42 to 4.3 % as citric acid for the fruit of the cultivars Coronet and Crusader.The colour of the black currant fruit extracts is shown in Figure 24. The fruit of all cultivars had similar hue angles. The fruit of the cultivar Wellington and of the selection 5-23-42 were the most vivid as indicated by the chroma value.

Statistical analysis of the fruit of the black currant cultivars harvested in 2000 is presented in Table 31. Fruit of the cultivars Magnus and Topsy had significantly lower ten fruit than the fruit of the other black currant cultivars. The total solids contents of the fruit of the cultivars Topsy, Magnus, Consort, and the selection 5-24-9 were significantly higher than the fruit of the other cultivars. Statistical differences in pH are negligible due to the narrow range of pH values. There were no significant differences in hue angles and L values. Fruit of the cultivar Willoughby had significantly higher titratable acidity than fruit of the other cultivars.

Summary

Fruit of the cultivar Consort harvested at Outlook consistently had the lowest ten fruit weight, 2.6 to 6.7 g. The maximum ten fruit weight was found for the fruit of the selection 5-23-42 harvested in 1999. Fruit of the cultivar Consort also exhibited the highest total solids content over the years harvested. The pH was very consistent for the fruit of the cultivars harvested from year to year. The highest pH, 3.3, was noted for the fruit of the selections 5-32-42 and 5-23-23 harvested in 1997. The maximum soluble solids content was found in the fruit of the cultivar Wellington harvested in 2000, 19.7°Brix. The colour of the fruit juice extracts varied with location in 2000. The highest total titratable acidity was recorded for the fruit of the cultivar Consort harvested in 1998 at Outlook, 5.0 % as citric acid, and the minimum was recorded for the fruit of the selection 5-23-42 harvested in 1999 at Yorkton, 2.9 % as citric acid. Generally, the total titratable acidities of fruit harvested in 1998 was greater than that of fruit harvested in 1999 and 2000.

3.3.3.2 Sensory Analysis of Black Currant Juice

The titratable acidity (measured as citric acid) and soluble solids of the commercial product, Ribena, were 1.2% and 69°Brix, respectively. Initially the juice preparations of Wellington, Boskoop Giant and numbered selection 5-23-42 had titratable acidities of 1.7%, 1.8% and 0.6% and soluble solids contents of 9.6°Brix, 7.0°Brix and 4.0°Brix, respectively. Titratable acidities and soluble solids contents were adjusted for the sensory analysis trial as shown in Table 32.

Juice prepared from the fruit of Wellington was assessed twice. No significant difference was found between it and the commercial product in the first assessment and panelists were divided in their preferences. In the second assessment, although there was a difference noted, panelists who were correct in their identification were once again divided in their preference of juice concentrates. Juice prepared from the fruit of Boskoop Giant was also assessed twice. During the first assessment panelists were able to distinguish between the two selections (Boskoop Giant and Ribena) and correct panelists generally preferred Ribena. When product was assessed the second time no significant difference was seen and correct panelists were split in their preference. Juice prepared from the fruit of selection 5-23-42 was assessed twice. Significant differences were noted in both samplings and panelists generally preferred the commercial product, Ribena. The raw fruit has a signficantly higher pH and lower titratable acidity than Wellington and Boskoop Giant which may be affecting the final flavour of the juice concentrate, even with an adjustment of the titratable acidity by the addition of citric acid. (Table 32)

3.3.4 Pin Cherry

3.3.4.1 Physicochemical analyses

1997

Three named cultivars of pin cherry, Jumping Pound, Lee #4 and Mary Liss at Saskatoon and Indian Head sites were harvested in 1997. The results and statistical analysis are presented in Table 33. The cultivar Lee #4 was significantly different than the cultivars Jumping Pound and Mary Liss. The fruit of the cultivar Lee #4 had lower individual fruit weight and soluble solids content, as well as higher pH and moisture content, compared to fruit of the other cultivars.Fruit harvested at the Saskatoon site was also subjected to Hunterlab analysis. Jumping Pound and Mary Liss had similar and lower L values (L is an indicator of lightness with 0 being black and 100 being white) while Lee #4 was lighter; the values were 41.3, 53.9 and 42.7 for Jumping Pound, Lee #4 and Mary Liss, respectively. The hue angle ($\tan^{-1}$ b/a) was similar for all three at 46.4, 42.7 and 48.3 which indicates fruit which were orange red, rather than purple red.

1998

The fruit of two pin cherry cultivars, Jumping Pound and Mary Liss, were evaluated (Table 34). There were no statistically significant differences between the two cultivars. However, data from only the Saskatoon site was available. To be certain that the fruit characteristics of the cultivars Jumping Pound and Mary Liss do not differ significantly, it would be desirable to collect fruit from other locations. It is possible that given varying environmental conditions the cultivars may produce fruit with significantly different characteristics. Compared to the choke cherry fruit, pin cherry fruit contains less pit. The large amount of flesh available may make pin cherry fruit appealing to the processing industry. Past analyses of pin cherry fruit has established that all cultivars produce orange-red coloured fruit. To efficiently remove flesh from the pit for percent pit determination, pectic enzymes were utilized indicating considerable pectin may be present. Thus, evaluation of the pectin content of pin cherry fruit is warranted. Pectin content is a particularly important attribute in the jam and jelly industries. Pin cherry fruit may well be suitable to such applications.

1999

The fruit of three pin cherry cultivars, Jumping Pound, Lee #4, and Mary Liss, were evaluated (Table 35). Fruit of the cultivar Lee #4 had the largest ten fruit weight, 8.3 g, the least total solids, 20.8 %, the greatest percent pit, 7.4 %, and thus the least estimated percent flesh, 13.9 %. It is undesirable for fruit to have a large percent pit and small amount of flesh, as the pits are waste product and the flesh is the usable portion. It appears the fruit of the cultivars Jumping Pound and Mary Liss may be better suited for processing due to higher estimated percent flesh compared to the fruit of the cultivar Lee #4. Fruit of all three pin cherry cultivars had a pH of 3.2. Soluble solids content was greatest for the fruit of the cultivar Jumping Pound, 15.4 °Brix.

The L values and hue angles reveal that the fruit of the cultivar Jumping Pound was lighter and slightly more orange in colour compared to fruit of the other cultivars. Figure 25 shows that the fruit of the pin cherry cultivars were similar in hue and had chroma ranging from somewhat dull to vivid. Statistical analysis of data collected for the pin cherry fruit harvested from Yorkton showed Lee #4 to have significantly larger percent pit, lower L value, and larger hue angle than fruit of the other cultivars (Table 36).

2000

Fruit characteristics of pin cherry cultivars harvested in 2000 are presented in Table 37. Fruit of the cultivar Lee#4 exhibited the lowest and highest ten fruit weight, total solids, and soluble solids depending on location. The fruit of the cultivar Lee#4 also had the greatest percent pit compared to the fruit of the other cultivars. PH was the same for the fruit of all three cultivars, 3.1. The colour of the fruit juice extracts is shown in Figure 26. Statistical analysis revealed that the fruit of the cultivars were significantly different in L value and hue angle (Table 38).

Summary

The maximum ten fruit weight, 8.3 g, was found for the fruit of the cultivar Lee#4 harvested in 1999 at Saskatoon. Overall, the largest ten fruit weights were recorded for fruit of cultivars harvested in 1999. Generally, total solids content was lowest for the fruit of all cultivars harvested in 2000. Among the fruit harvested in 1998, 1999, and 2000, the largest percent pit was that of the fruit of the cultivar Lee#4 harvested in 2000, 7.5% and least for that of the fruit of the cultivar Mary Liss harvested in 2000, 5.6%. The pH values were very consistent and generally the same for the fruit of all cultivars harvested in any given year. The pH values ranged from 3.1 to 3.5. The maximum soluble solids content was recorded for the fruit of the cultivar Jumping Pound harvested in 1998, 20.4°Brix, and the minimum was recorded for the fruit of the cultivar Lee#4 harvested in 1999, 12.4°Brix. Similar L values and hue angles were found in 1999 and 2000 for the fruit of each pin cherry cultivar harvested.

3.3.5 Highbush cranberry

3.3.5.1 Physicochemical analyses

1999

Fruit characteristics of highbush cranberry cultivars harvested in 1999 are presented in Table 39. The lowest ten fruit weights were exhibited by fruit of the cultivar Phillips. Total solids contents ranged from 16.9% for the fruit of the cultivar Phillips harvested at Indian Head to 21.9% for the fruit of the cultivar Alaska harvested at Outlook. Fruit of the cultivar Manito had the least percent pit and the fruit of the cultivar Garry Pink had the greatest. The pH values of the fruit were similar for all cultivars. Soluble solids content ranged from 9.0°Brix for the fruit of the cultivar Andrews to 12.5°Brix for the fruit of the cultivar Alaska harvested at Outlook. The colour of the juice extracts is shown in Figure 27. Fruit of all highbush cranberry cultivars had

similar hue angles. Statistical analysis indicated that fruit of the highbush cranberry cultivars Alaska, Phillips, and Wentworth differed significantly in ten fruit weight, pH, and colour (Table 40). However, the range of pHs, hue angles, and chroma values was very narrow making differences negligible in practice.

2000

Characteristics of the fruit of highbush cranberry cultivars harvested in 2000 are presented in Table 41. Fruit of the cultivar Andrews had the lowest ten fruit weight 4.2 g and fruit of the cultivar Alaska harvested at Saskatoon had the largest, 6.6 g. Total solids contents ranged from 17.6% for fruit of the cultivar Andrews to 20.6% for the fruit of the cultivar Wentworth harvested at Saskatoon. Fruit of the cultivar Garry Pink had the largest percent pit 8.9% and fruit of the cultivar Manito had the lowest, 5.1%. Fruit pH ranged from 2.8 to 3.1. The lowest soluble solids content was found in the fruit of the cultivar Andrews, 11.5°Brix. The colour of the juice extracts is shown in Figure 28. The hue angle of the fruit of all cultivars was very similar. Statistical analysis indicated that the ten fruit weight of fruit of the cultivars Alaska and Manito was significantly greater than that of fruit of other cultivars and the fruit of the cultivar Andrews to be significantly less (Table 42). Fruit of the cultivar Andrews also had significantly lower total solid content and soluble solids content than fruit of the other cultivars. Fruit of the cultivar Garry Pink had significantly greater percent pit and the fruit of the cultivar Manito had significantly lower percent pit than the fruit of the other cultivars. Although significant differences in pH were present, the range of values is very narrow, 2.9 to 3.1. The colour of the fruit of the cultivar Manito appeared significantly different than that of the fruit of the other cultivars, by being slightly more red and more vivid.

Summary

The maximum ten fruit weight was recorded for the fruit of the cultivar Manito harvested in 2000, 7.8 g. The minimum ten fruit weight was that of fruit of the cultivar Phillips harvested in 1999, 3.5 g. Fruit of the cultivar Phillips harvested in 1999 also had the minimum total solids content,16.9%. The fruit of the cultivar Alaska harvested in 1999 had the largest total solids content, 21.9%, and also had the maximum estimated percent flesh, 17.1%. In both 1999 and 2000, fruit of the cultivar Garry Pink had the largest percent pit, 7.0 and 8.9%, respectively. The lowest percent pit values, in both 1999 and 2000, were those of fruit of the cultivar Manito, 4.0 and 5.1%, respectively. The pH of the fruit of the highbush cranberry cultivars harvested was consistent among cultivars and years, ranging from 2.8 to 3.3 overall. The hue angles of the fruit of all cultivars were also very similar.

3.4 General Discussion and Conclusions

Fruit quality characteristics of the saskatoon fruit are summarized in Table 43. The fruit characteristics of each cultivar are presented by year (1997 to 2000) and by site (Moon Lake, SK and Saskatoon, SK) for all available data. The overall mean for each quality characteristic is also presented. It is noteworthy that the fruit of the saskatoon cultivars Martin, Thiessen, and PAR90TRS always had the largest ten fruit weights and the fruit of the cultivars Success and

Bluff were typically lowest in ten fruit weight. In 1999, the ten fruit weight of fruit of the cultivars Nelson, Parkhill, Regent, and Success were noticeably greater than that of other years. However, fruit of the other cultivars did not follow this pattern. The ten fruit weights were very similar between locations, except for fruit of the cultivar Smoky which had a ten fruit weight of 11.8 g at Moon Lake and of 9.9 g at Saskatoon. Total solids content did not vary considerably among years or sites. The pH values were very consistent from year to year and between the sites. Fruit of the cultivars Martin, Nelson, PAR90TRS, Northline, Quaker, and Thiessen typically had lower pH values (3.6 to 3.8). Fruit of the cultivars Forestburg, Parkhill, PearsonII, Regent, and Smoky had pH values that were slightly higher (4.1 to 4.2). Soluble solids content was generally greater in 2000 compared to other years. There were no apparent differences in soluble solids contents between the sites. The colour of the saskatoon fruit extracts, as described by the L value and hue angle, did not noticeably vary among years or between sites. The fruit of ten cultivars (Buffalo, Forestburg, Honeywood, Martin, Nelson, Northline, Parkhill, PearsonII, Smoky, and Success) generally had slightly higher total titratable acidity values in 2000. However, the fruit of the cultivars Bluff, PAR90TRS, Pembina, and Thiessen had slightly lower total titratable acidity values in 2000. Therefore, no trends were evident for total titratable acidity given the available data. Saskatoon fruit of the cultivars Nelson, Bluff, and Northline had the largest total anthocyanin contents in both 1999 and 2000. Sensory evaluation of saskatoon fruit as pie filling revealed the fruit of the cultivars Nelson and Northline have the least pleasant flavour of the fruit evaluated. It does not appear freeze-drying is applicable to whole saskatoon fruit.

Choke cherry fruit quality characteristics are summarized in Table 44. The fruit characteristics of the cultivars Garrington, Lee#4, and Boughen Yellow are presented by year (1998 to 2000) and by site (Outlook, SK and Saskatoon, SK) for all available data. The overall mean for each quality characteristic is also presented. Ten fruit weight, total solids content, and pH were all very similar from year to year and between sites for the fruit of each cultivar. Soluble solids content was greater in 2000 than the other years. No trends were noticeable in the percent pit and colour (L value and hue angle) data. Fruit of the choke cherry cultivar Boughen Yellow does not appear particularly well suited to processing applications given its low ten fruit and large percent pit. The fruit of choke cherry cultivars such as Goertz which demonstrated large ten fruit weight and low percent pit would be more useful (Tables 22 and 24). Large fruit weight and low percent pit suggests the amount of utilizable fruit is maximized.

Black currant fruit quality characteristics are summarized in Table 45. The fruit characteristics of the several selections and cultivars are presented by year (1998 to 2000) and by site (Saskatoon, SK and Yorkton, SK) for all available data. The overall mean for each quality characteristic is also presented. Variations in ten fruit weight among years and between sites were negligible, except for that of the selection 5-24-9 which had a much higher ten fruit weight in 1999 (12.4 g) and at Saskatoon (12.5 g) compared to other years (9.6 g) and to the Yorkton site (9.5 g). The fruit of the selection 5-24-9 had a consistently higher pH (3.2) than the fruit of other selections and cultivars. The pH for each cultivar was very consistent among years and between sites. Soluble solids content was always greatest for fruit harvested in 2000. Variation between sites in soluble solids content was not evident. Total titratable acidity results were typically higher for the fruit harvested in 1998. Hue angles were often slightly higher for fruit

harvested in 1998. Evaluation of black currant fruit demonstrated differences in fruit characteristics due to year of harvest.

Fruit quality characteristic of the pin cherry fruit are summarized in Table 46. The characteristics are presented by year (1998 to 2000) and by site (Outlook, SK and Saskatoon, SK) for all available data. The overall mean for each quality characteristic is also presented. Trends in the data based on year and site are difficult to ascertain due missing data. Generally, the fruit the pin cherry cultivars evaluated had very similar fruit quality characteristics.

Highbush cranberry fruit quality characteristics are summarized in Table 47. The fruit characteristics of several cultivars are presented by year (1999 and 2000) and by site (Outlook, SK and Saskatoon, SK). The overall mean for each quality characteristic is also presented. Ten fruit weight and pH were very similar between years and sites for each cultivar. Soluble solids content and percent pit were typically greater in the fruit harvested in 2000. Fruit of the highbush cranberry cultivar Manito may be suited to value added processing due to its large ten fruit weight and low percent pit. Generally, for all fruit containing pits a low percent pit values in combination with high fruit weight is desirable for processing applications. The amount of waste generated by the pit would be minimized while the amount of useable flesh would be maximized.

In comparison to blueberry, a commercially viable fruit, saskatoon fruit are larger, have higher soluble solids content, are comparable in total titratable acidity, and have a much lower anthocyanin content. Kalt and McDonald (1996) found blueberries to have a mean weight of 0.33 g/fruit , soluble soluble solids content of 11.2°Brix, total acid content of 0.59 %, and an anthocyanin content of 11.0 mg/g. Saskatoon fruit analysed in this studied had a weight of 0.71 to 1.69 g/fruit, soluble solids content of 13.0 to 21.4°Brix, total acid content of 0.28 to 0.64%, and an anthocyanin content of 0.357 to 0.899 mg/g.

Choke cherry and pin cherry fruit may be comparable to commercially available sour cherries. Hui (1996) noted that sour cherries generally have a soluble solids content of 14.0°Brix. Choke cherry and pin cherry fruit typically had a high soluble solids content in comparison, 12.1 to 26.4°Brix and 13.0 to 20.4°Brix, respectively. Soluble solids content of choke cherry fruit analysed was greater than that found by Panford (1995) for choke cherry fruit, 9.0 to 12.3°Brix. The pH values found by Panford (1995), 4.0 to 4.3, were comparable to the values found in this study, 3.7 to 4.3.

Blom and Skrede (1984) evaluated four black currant cultivars over two years and found a range of soluble solids content from 13.1 to 14.9°Brix, as well as a pH range of 3.0 to 3.2 and a range of total titratable acidity from 3.1 to 4.6%. Black currant fruit were found to have a soluble solids content from 17.0 to 26.3°Brix, pH of 2.9 to 3.0, and total titratable acidity of 2.9 to 5.0% in this study. Therefore, the black currant fruit analysed were similar in pH, higher in soluble solids content, and had a greater range of acidity compared to the fruit evaluated by Blom and Skrede (1984).The pH of the highbush cranberry analysed, 2.8 to 3.3, was higher than that found by Supers et al (1983) for bog cranberry, 2.5 to 2.7. Supers et al (1983) also reported a soluble solids content range of 7.2 to 10.4°Brix for bog cranberry, which was generally lower than the content of highbush cranberry analysed in this study, 9.0 to 14.7°Brix.

The fruit quality characteristics of saskatoon, choke cherry, black currant, pin cherry, and highbush cranberry fruit have not been previously reported. The data presented are a unique collection allowing for general characterization of these fruits. This information will aid fruit processors by providing detailed knowledge of starting material. Characteristics such as soluble solids content and pH are essential in the determination of product formulations. Further research regarding the influence of fruit characteristics on product formulations and processing parameters will aid in promoting value-added processing of native fruits. The data may also aid in developing standards of identity for the various fruits. As well, the existing data will serve as an basis for developing new fruit cultivars, monitoring the influence of environmental conditions, and assessing the impact of agronomic practices. Further research may involve generating models to describe the relationship between fruit quality characteristics and environmental conditions and/or agronomic practices. Continued evaluation of fruit quality characteristics is also warranted to augment the existing data.

3.5 References

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3.6 Tables

Table 1. Treatments applied to cultivars for purposes of screening panelists during the first six sessions of the sensory evaluation of saskatoon pie fillings in 1998.

Session	Treatment	Cultivar
1	50% Sugar Increase	Smoky
1	50% Sugar Decrease	Pembina
2	25% Sugar Decrease	Pembina
2	25% Sugar Increase	Smoky
3	50% Malic Acid Increase [1]	Honeywood
3	75% Malic Acid Increase	Smoky
4	25% Malic Acid Increase	Honeywood
4	25% Malic Acid Increase	Smoky
5	15 ml Almond Extract Added	Smoky
5	5 ml Lemon Oil Added	Smoky
6	Tea flavour added [2]	Smoky
6	Oak flavour added [3]	Smoky

[1] Malic acid increases were based on the average naturally occurring malic acid content.
[2] Six orange pekoe tea bags (Lipton, Toronto, ON) were boiled in 800 ml of water, of which 450 g was substituted for water in the formulation.
[3] Twenty grams of oak mor powder (Spagnolis, New Westminster, BC) was boiled in 800 ml of water, of which 450 g was substituted for water in the formulation.

Table 2. Formulation used to prepare pie fillings from saskatoon fruit for sensory evaluation in 1998.

Ingredient	Grams [1]	Percentage
Frozen Saskatoons	750	49
Sugar	288	19
Cold Soluble Starch [2]	45	3
Distilled Water	450	29

[1] The amounts noted yield one 1L jar plus one 250ml jar.
[2] The commercial product name is Clear Gel A.

Table 3. The numerical ratings applied to category scale descriptors used for the sensory evaluation of saskatoon pie fillings.

Numerical Rating	Category Scale Descriptor
1	Extremely more tart/more sweet/more firm/more seedy/ stronger flavour/more pleasant saskatoon flavour than R[1]
2	Much more tart/more sweet/more firm/more seedy/ stronger flavour/more pleasant saskatoon flavour than R
3	Moderately more tart/more sweet/more firm/more seedy/ stronger flavour/more pleasant saskatoon flavour than R
4	Slightly more tart/more sweet/more firm/more seedy/ stronger flavour/more pleasant saskatoon flavour than R
5	As tart/sweet/firm/seedy as R, Equal in flavour to R, or Equally pleasant saskatoon flavour as R
6	Slightly less tart/less sweet/less firm/less seedy/ weaker flavour/less pleasant saskatoon flavour than R
7	Moderately less tart/less sweet/less firm/less seedy/ weaker flavour/less pleasant saskatoon flavour than R
8	Much less tart/less sweet/less firm/less seedy/ weaker flavour/less pleasant saskatoon flavour than R
9	Extremely less tart/less sweet/less firm/less seedy/ weaker flavour/less pleasant saskatoon flavour than R

[1] R=Reference sample.

Table 4. Fruit characteristics of saskatoon cultivars harvested in 1997 from several locations in Saskatchewan.

Cultivar	Location	pH	Soluble Solids (°Brix)	Hue Angle [1] (°)
Bluff	Hudson Bay	4.2[2](0.03)[3]	12.9 (0.39)	-13.7 (9.85)
	Moon Lake	4.1 (0.00)	14.4 (0.84)	-26.4 (8.11)
	Saskatoon	4.1 (0.03)	13.8 (0.67)	15.9 (38.02)
	Yorkton	3.9[4](0.00)	14.2[4](1.55)	-1.2[5](3.51)
		4.1[6](0.03)[7]	13.8 (0.38)	-6.8 (10.69)
Buffalo	Hudson Bay	4.1[4](0.10)	13.8[4](0.15)	-13.7 (9.85)
	Moon Lake	4.1 (0.03)	14.8 (0.86)	-26.4 (8.11)
	Saskatoon	4.2 (0.00)	16.3 (1.27)	15.9 (38.02)
	Yorkton	4.0 (0.05)	14.4[5](0.20)	-1.2[4](3.51)
		4.1 (0.03)	15.0 (0.56)	-6.8 (10.69)
Forestburg	Hudson Bay	4.3 (0.060	15.5 (0.32)	2.6 (3.44)
	Moon Lake	4.2 (0.03)	14.8 (0.46)	-6.6 (8.10)
	Saskatoon	4.2 (0.00)	13.6 (0.35)	3.4 (5.16)
	Yorkton	4.2[4](0.00)	16.4[4](0.70)	-3.1[4](2.18)
		4.2 (0.02)	14.9 (0.36)	-0.7 (2.75)
Honeywood	Hudson Bay	4.2[4](0.00)	16.5[4](0.48)	-12.3[4](6.51)
	Moon Lake	4.1 (0.03)	14.2 (1.17)	-19.0 (6.38)
	Saskatoon	4.1 90.06)	13.1 (0.62)	-5.2 (4.37)
	Yorkton	4.0[4](0.15)	16.0[4](0.50)	3.2[5](1.26)
		4.1 (0.04)	14.7 (0.58)	-10.5 (3.62)
Martin	Hudson Bay	3.7 (0.06)	13.3 (0.17)	-10.3 (9.04)
	Moon Lake	3.7 (0.03)	14.4 (0.55)	-6.6 (6.15)
	Saskatoon	3.7 (0.03)	14.3 (0.37)	3.8 (1.33)
	Yorkton	3.6 (0.12)	13.0 (0.18)	7.8 (0.67)
		3.7 (0.03)	13.8 (0.24)	-1.3 (3.24)
Nelson	Hudson Bay	3.7 (0.03)	16.9 (0.42)	-8.6 (4.21)
	Moon Lake	3.7 (0.03)	14.0 (0.47)	-5.2 (5.18)
	Saskatoon	3.8[4](0.10)	19.3[4](3.55)	-10.2[4](7.72)
	Yorkton	NA[8]	NA	NA
		3.7 (0.03)	16.4 (1.05)	-7.7 (2.71)
Northline	Hudson Bay	3.8 90.03)	13.3 (0.21)	2.8 (1.16)
	Moon Lake	3.8 (0.03)	15.4 (0.53)	-16.8 (6.14)
	Saskatoon	3.8 (0.00)	13.6 90.25)	-7.9 (3.32)
	Yorkton	3.8[4](0.10)	14.2[4](0.05)	-16.2[4](3.34)
		3.8 (0.02)	14.1 (0.30)	-8.9 (3.06)

PAR90TRS	Hudson Bay	3.7[4](0.00)	13.8[4](0.55)	-9.2[4](4.03)
	Moon Lake	3.7 (0.00)	14.6 (0.350	-12.6 (1.85)
	Saskatoon	3.7 (0.03)	15.0 (0.40)	-4.8 (8.54)
	Yorkton	3.7 (0.03)	13.6 (0.70)	-2.5 (9.51)
		3.7 (0.01)	14.3 (0.29)	-7.1 (3.32)
Parkhill	Hudson Bay	4.1 (0.03)	14.0 (0.67)	-9.5 (8.83)
	Moon Lake	4.3[4](0.05)	12.7[4](0.30)	-0.5[4](1.80)
	Saskatoon	4.2 (0.03)	15.5 (1.32)	-10.5 (7.27)
	Yorkton	4.0 (0.03)	13.5 (0.09)	-15.6 (7.26)
		4.1 (0.04)	14.0 (0.47)	-9.8 (3.55)
Pasture	Hudson Bay	NA	NA	NA
	Moon Lake	NA	NA	NA
	Saskatoon	3.8 (0.03)	14.2 (0.39)	2.1 (3.72)
	Yorkton	NA	NA	NA
		3.8	14.2	2.1
PearsonII	Hudson Bay	4.3[4](0.05)	15.8[4](0.35)	-11.3 (3.59)
	Moon Lake	4.0 (0.03)	12.0 (0.27)	3.1 (6.75)
	Saskatoon	4.0 (0.03)	13.2 (0.55)	2.8 (0.92)
	Yorkton	4.3 (0.03)	15.9 (0.47)	-7.6 (7.54)
		4.1 (0.04)	14.1 (0.56)	-3.3 (2.99)
Pembina	Hudson Bay	4.3[4](0.05)	19.0[4](3.10)	-9.8[4](8.98)
	Moon Lake	3.9 (0.13)	18.3 (0.80)	4.5 (6.81)
	Saskatoon	4.0 (0.00)	20.8 (0.87)	2.0 (2.90)
	Yorkton	NA	NA	NA
		4.0 (0.07)	19.4 (0.36)	0.0 (3.67)
Quaker	Hudson Bay	NA	NA	NA
	Moon Lake	3.7 (0.03)	14.2 (0.54)	-11.4 (9.41)
	Saskatoon	3.7 (0.03)	13.1 (0.20)	-10.7 (6.73)
	Yorkton	NA	NA	NA
		3.7 (0.02)	13.6(0.36)	-11.0 (5.18)
Regent	Hudson Bay	4.0 (0.00)	13.4 (0.59)	-3.6 (6.90)
	Moon Lake	4.2 (0.03)	13.9 (1.05)	-20.4 (13.3)
	Saskatoon	4.1 (0.03)	13.6 (1.39)	-6.2 (11.70)
	Yorkton	4.1 (0.00)	15.1 (0.37)	-17.4 (10.23)
		4.1 (0.03)	14.0 (0.44)	-11.9 (5.08)
Smoky	Hudson Bay	4.3 (0.03)	15.7 (0.42)	-21.0 (11.38)
	Moon Lake	4.1 (0.07)	13.4 (1.86)	-2.0 (5.83)
	Saskatoon	4.1 (0.03)	12.8 (0.24)	-4.2 (6.62)
	Yorkton	4.2[5](0.01)	15.8[5](0.00)	-3.0[5](2.15)
		4.2 (0.03)	14.1 (0.66)	-8.4 (4.62)
Success	Hudson Bay	4.0[4](0.00)	13.9[4](0.05)	-14.7[4](9.68)
	Moon Lake	4.0 (0.03)	12.6 (0.24)	-5.7 (3.83)
	Saskatoon	4.0 (0.03)	13.8 (0.48)	-9.0 (1.65)
	Yorkton	4.2 (0.03)	15.9 (0.86)	-21.6 (3.88)
		4.1 (0.02)	14.0 (0.46)	-12.6 (2.72)

Thiessen	Hudson Bay	3.7 (0.03)	13.6 (0.32)	2.3 (0.81)
	Moon Lake	3.7 (0.00)	13.7 (1.05)	-0.3 (4.25)
	Saskatoon	3.9 (0.20)	14.3 (0.51)	-8.2 (8.92)
	Yorkton	3.7 (0.00)	13.9 (0.66)	3.8 (3.01)
		3.8 (0.05)	13.9 (0.31)	-0.6 (2.61)
Population Mean		4.0	14.5	-6.7
(Population Std. Deviation)		(0.22)	(1.95)	(14.34)

[1] Hue angle=$\tan^{-1}$(b/a)
[2] Unless otherwise noted, refers to the mean of three replicated plants within a site.
[3] Standard error of the replicate mean.
[4] Fruit from only two replicated plants within a site available for analysis.
[5] Fruit from only one plant within a site available for analysis.
[6] Mean of all samples collected for a particular cultivar.
[7] Standard error of cultivar mean.
[8] NA= Not available due to insufficient amount of sample.
Shaded values indicate the minimum or maximum cultivar mean within a column.

Table 5. Statistical comparison of fruit characteristics of saskatoon cultivars harvested in 1997[1].

Cultivar	Mean pH	Mean Soluble Solids (°Brix)	MeanHue[2] Angle (°)
Bluff	4.0 b[1]	14.1 a	-4.3 a
Buffalo	4.1 bc	15.4 a	-14.6 a
Forestburg	4.2 c	14.7 a	-2.0 a
Honeywood	4.1 bc	14.2 a	-9.9 a
Martin	3.7 a	13.9 a	1.7 a
Northline	3.8 ab	14.4 a	-13.3 a
PAR90TRS	3.7 a	14.4 a	-6.6 a
Parkhill	4.1 bc	14.1 a	-9.9 a
PearsonII	4.1 bc	13.7 a	-0.6 a
Regent	4.2 bc	14.2 a	-14.7 a
Smoky	4.1 bc	13.5 a	-3.1 a
Success	4.1 bc	14.1 a	-12.1 a
Thiessen	3.8 ab	14.0 a	-1.6 a

[1] The cultivars Pasture, Pembina, and Quaker were excluded due to lack of data. Moon Lake, Saskatoon, and Yorkton were the only locations included.
[2] Values with the same letter within a column are not significantly different (<0.05).
Shaded values indicate the minimum or maximum value within a column.

Table 6. Fruit characteristics of saskatoon cultivars harvested in 1998 from several locations in Saskatchewan.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	pH	Soluble Solids (°Brix)	Hue Angle[1] (°)
Bluff	Makwa	NA[2]	NA	NA	NA	NA
	Moon Lake	6.3[3](0.26)[4]	19.7 (0.40)	3.9 (0.03)	12.5 (0.09)	-10.6 (6.41)
	Saskatoon	7.5 (0.11)	22.0 (0.52)	4.0 (0.03)	14.8 (0.49)	-29.5 (2.22)
	Yorkton	9.2 (0.71)	21.2 (0.14)	4.1 (0.03)	15.1 (0.23)	-20.6 (3.50)
		7.8[5] (0.43)[6]	21.0 (0.39)	4.0 (0.04)	14.1 (0.44)	-20.2 (3.51)
Buffalo	Makwa	NA	NA	NA	NA	NA
	Moon Lake	8.6 (0.15)	22.2 (0.68)	4.0 (0.03)	15.4 (0.32)	-9.1 (3.70)
	Saskatoon	10.0 (0.15)	24.0 (0.84)	4.1 (0.06)	16.7 (0.81)	-17.8 (7.20)
	Yorkton	10.6[7] (2.20)	23.4[7](1.11)	4.2 (0.05)	16.4[7](0.50)	-13.0[7](1.45)
		9.6 (0.52)	23.2 (0.52)	4.1 (0.04)	16.2 (0.37)	-13.3 (3.03)
Forestburg	Makwa	NA	NA	NA	NA	NA
	Moon Lake	12.5 (0.24)	20.0 (0.57)	4.2 (0.03)	14.6 (0.58)	-10.8 (3.03)
	Saskatoon	11.8 (0.08)	22.0 (0.87)	4.2 (0.07)	16.1 (0.71)	-13.2 (6.07)
	Yorkton	11.9 (0.34)	22.2 (1.51)	4.1 (0.03)	15.6 (1.07)	-12.5 (1.90)
		12.1 (0.16)	21.4 (0.63)	4.2 (0.02)	15.4 (0.46)	-12.2 (2.06)
Honeywood	Makwa	NA	NA	NA	NA	NA
	Moon Lake	11.6 (0.64)	20.9 (0.65)	4.1 (0.06)	15.3 (0.44)	-20.6 (2.97)
	Saskatoon	10.7 (0.81)	24.4 (1.18)	4.2 (0.03)	17.5 (0.65)	-8.3 (6.46)
	Yorkton	14.1 (1.15)	22.0 (1.04)	4.0 (0.12)	15.2 (0.62)	-4.7 (2.23)
		12.2 (0.67)	22.5 (0.71)	4.1 (0.05)	16.0 (0.48)	-11.2 (3.23)
Martin	Makwa	14.9 (0.91)	24.0 (0.79)	3.8 (0.06)	17.0 (0.56)	-14.1 (8.76)
	Moon Lake	16.1 (0.99)	19.0 (0.65)	3.6 (0.03)	13.6 (0.23)	-17.1 (4.00)
	Saskatoon	16.8 (0.55)	20.7 (0.08)	3.7 (0.03)	15.0 (0.32)	-8.0 (3.66)
	Yorkton	16.9 (0.65)	22.0 (0.48)	3.8 (0.06)	15.7 (0.18)	-4.0 (3.88)
		16.2 (0.41)	21.4 (0.61)	3.7 (0.03)	15.4 (0.40)	-6.0 (2.81)
Nelson	Makwa	NA	NA	NA	NA	NA
	Moon Lake	9.6 (0.44)	25.3 (1.37)	3.5 (0.00)	18.1 (1.37)	-15.1 (7.86)
	Saskatoon	10.4[7](0.73)	29.4[7](1.93)	3.7[7](0.00)	22.5[7](2.40)	-24.8[7](5.40)
	Yorkton	12.5[7](0.64)	25.5[7](0.50)	3.7[7](0.00)	19.1[7](0.70)	-14.0[8]
		10.6 (0.57)	26.5 (1.01)	3.6 (0.04)	19.6 (1.07)	-18.1 (4.33)

Northline	Makwa	NA	NA	NA	NA	NA
	Moon Lake	8.7 (0.21)	22.0 (0.13)	3.7 (0.03)	14.4 (0.10)	-8.5 (3.41)
	Saskatoon	10.3 (1.38)	23.2 (0.57)	3.7 (0.03)	16.1 (0.27)	-22.8 (6.47)
	Yorkton	11.2 (0.66)	21.7 (0.50)	3.8 (0.03)	15.1 (0.21)	-18.0 (0.35)
		10.1 (0.58)	22.3 (0.32)	3.7 (0.02)	15.2 (0.26)	-16.4 (2.97)
PAR90TRS	Makwa	15.0 (0.67)	22.6 (0.47)	3.8 (0.03)	16.2 (0.34)	-6.4 (3.40)
	Moon Lake	16.1 (0.37)	19.9 (0.57)	3.7 (0.00)	14.0 (0.55)	-7.6 (0.78)
	Saskatoon	15.6 (0.71)	22.9 (1.04)	3.7 (0.00)	16.1 (0.61)	-8.9 (0.96)
	Yorkton	17.2 (0.30)	22.2 (0.89)	3.7[7](0.10)	15.7[7](0.35)	-4.0 (1.29)
		16.0 (0.34)	21.9 (0.49)	3.7 (0.02)	15.5 (0.36)	-6.7 (0.98)
Parkhill	Makwa	NA	NA	NA	NA	NA
	Moon Lake	8.8 (0.45)	24.5 (0.56)	4.2 (0.03)	17.1 (0.52)	-14.1 (5.86)
	Saskatoon	6.9 (0.43)	21.8 (0.62)	4.2 (0.00)	16.1 (0.35)	-16.0 (1.34)
	Yorkton	13.0 (0.92)	21.3 (0.64)	4.2 (0.03)	15.8 (0.55)	-16.3 (4.41)
		9.6 (0.96)	22.5 (0.58)	4.2 (0.02)	16.3 (0.32)	-15.5 (2.18)
Pasture	Makwa	13.9 (0.48)	22.5 (0.40)	3.8[7](0.05)	16.0[7](0.15)	-2.2[7](3.95)
	Moon Lake	NA	NA	NA	NA	NA
	Saskatoon	15.8 (0.47)	20.8 (0.51)	3.8 (0.03)	14.9 (0.24)	0.4 (2.70)
	Yorkton	NA	NA	NA	NA	NA
		14.5 (0.65)	21.7 (0.48)	3.8 (0.02)	15.3 (0.30)	-0.6 (2.04)
PearsonII	Makwa	NA	NA	NA	NA	NA
	Moon Lake	13.8 (0.58)	20.5 (0.68)	4.1 (0.03)	14.8 (0.54)	-3.9 (4.57)
	Saskatoon	11.2 (0.86)	23.1 (1.10)	4.2 (0.03)	16.8 (0.59)	-4.7 (4.08)
	Yorkton	11.9 (0.98)	22.7 (1.58)	4.3[7](0.05)	15.7[7](1.70)	-9.9 (3.74)
		12.3 (0.56)	22.1 (0.72)	4.2 (0.03)	15.8 (0.52)	-6.2 (2.27)
Pembina	Makwa	NA	NA	NA	NA	NA
	Moon Lake	8.0 (0.16)	29.7 (1.07)	3.9 (0.03)	22.3 (0.81)	-12.8 (3.81)
	Saskatoon	8.6 (0.35)	31.8 (1.00)	4.0[7](0.10)	23.5[7](1.40)	-3.7 (3.81)
	Yorkton	8.3[8]	31.4[8]	NA	NA	-11.6[8](0.74)
		8.3 (0.18)	30.8 (0.69)	4.0 (0.04)	22.8 (0.69)	-8.7 (2.71)

Quaker	Makwa	12.1 (0.33)	21.3[7](0.47)	NA	NA	-14.5[7](0.65)
	Moon Lake	13.7 (0.18)	18.2 (0.14)	3.7 (0.03)	12.6 (0.27)	-14.8 (4.20)
	Saskatoon	15.8 (0.23)	21.2 (0.21)	3.8 (0.00)	15.0 (0.26)	-13.9 (4.21)
	Yorkton	NA	NA	NA	NA	NA
		14.1 (0.56)	20.1 (0.57)	3.7 (0.03)	13.8 (0.55)	-14.4 (1.95)
Regent	Makwa	NA	NA	NA	NA	NA
	Moon Lake	8.2 (0.34)	22.9 (0.16)	4.1 (0.03)	17.1 (0.29)	-16.8 (8.27)
	Saskatoon	7.0 (0.30)	22.4 (0.24)	4.2 (0.03)	15.2 (0.27)	-26.9 (7.19)
	Yorkton	12.5 (0.97)	23.0 (0.36)	4.1 (0.03)	17.4 (0.67)	-27.0 (6.99)
		9.3 (0.91)	22.8 (0.17)	4.1 (0.02)	16.6 (0.41)	-23.6 (4.12)
Smoky	Makwa	NA	NA	NA	NA	NA
	Moon Lake	13.1 (0.49)	19.0 (0.26)	4.2 (0.00)	14.7 (0.45)	-10.0 (2.13)
	Saskatoon	9.7 (0.39)	23.6 (0.11)	4.2 (0.00)	17.7 (0.35)	-9.6 (2.10)
	Yorkton	12.8 (0.51)	24.1 (1.32)	4.3 (0.00)	17.4 (1.26)	-20.2 (6.95)
		11.9 (0.60)	22.2 (0.90)	4.2 (0.02)	16.6 (0.62)	-13.3 (2.80)
Success	Makwa	NA	NA	NA	NA	NA
	Moon Lake	7.0 (0.49)	21.7 (0.65)	4.1 (0.07)	14.5 (0.79)	-30.0 (9.50)
	Saskatoon	7.2 (0.28)	21.9 (0.70)	4.1 (0.00)	15.0 (0.22)	-31.6 (2.92)
	Yorkton	9.4[7](0.88)	24.8 (1.96)	4.3[7](0.15)	17.9[7](1.65)	-21.8[7](9.50)
		7.7 (0.92)	22.5 (0.70)	4.1 (0.05)	15.5 (0.66)	-28.6 (4.00)
Thiessen	Makwa	14.6 (0.62)	22.3 (0.54)	3.8[7](0.00)	15.4[7](0.45)	-25.1[7](8.70)
	Moon Lake	16.3 (0.46)	19.5 (0.20)	3.7 (0.00)	13.5 (0.23)	-12.2 (7.13)
	Saskatoon	16.8 (0.85)	21.6 (0.56)	3.8 (0.03)	15.6 (0.32)	-24.5 (4.16)
	Yorkton	16.8 (1.16)	19.9 (0.60)	3.8 (0.00)	13.8 (1.12)	-8.1 (1.30)
		16.1 (0.44)	20.8 (0.42)	3.8 (0.02)	14.5 (0.41)	-16.8 (3.27)
Population Mean (Population Std. Deviation)		12.0 (3.31)	22.5 (2.78)	4.0 (0.22)	15.9 (2.21)	-14.0 (10.25)

Hue angle=$\tan^{-1}(b/a)$

[2] NA= Not available due to insufficient amount of sample.

[3] Unless otherwise noted, is the mean of three replicated plants within a site.

[4] Standard error of the replicate mean.

[5] Mean of all samples collected for a particular cultivar.

[6] Standard error of cultivar mean.
[7] Fruit from only two replicated plants within a site available for analysis.
[8] Fruit from only one plant within a site available for analysis.
Shaded values indicate the minimum or maximum cultivar mean within a column.

Table 7. Statistical comparison of fruit characteristics of saskatoon cultivars harvested in 1998[1].

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean pH	Mean Soluble Solids (°Brix)	Mean Hue Angle (°)
Bluff	7.8 a[2]	21.0 ab	4.0 c	14.1 a	-20.2 b
Buffalo	9.6 ab	23.2 b	4.0 cd	16.2 ab	-13.3 ab
Forestburg	12.1 c	21.4 ab	4.2 d	15.4 ab	-12.2 ab
Honeywood	12.1 c	22.4 ab	4.1 cd	16.0 ab	-11.2 ab
Martin	16.6 d	20.6 ab	3.7 ab	14.8 ab	-9.7 ab
Nelson	10.6 bc	26.5 c	3.6 a	19.6 c	-17.1 ab
Northline	10.1 b	22.3 ab	3.7 b	14.3 ab	-16.4 ab
PAR90TRS	16.3 d	21.7 ab	3.7 ab	15.2 ab	-6.9 ab
Parkhill	9.6 ab	22.5 ab	4.2 d	16.3 b	-15.5 ab
PearsonII	12.3 c	22.1 ab	4.2 d	15.8 ab	-6.2 a
Regent	9.3 ab	22.8 b	4.1 d	16.6 b	-23.6 b
Smoky	11.9 bc	22.2 ab	4.2 d	16.6 b	-13.3 ab
Success	7.7 a	22.6 b	4.1 d	15.5 ab	-28.6 b
Thiessen	16.7 d	20.3 a	3.8 b	14.3 ab	-14.9 ab

[1] The cultivars Pasture, Pembina, and Quaker were excluded due to lack of data. Moon Lake, Saskatoon, and Yorkton were the only locations included. [2] Values with the same letter within a column are not significantly different (<0.05). Shaded values indicate the minimum or maximum value within a column.

Table 8. Fruit characteristics of saskatoon selections harvested in 1998 from the Accession orchard in Saskatoon.

Selection	Ten Fruit Weight (g)	% Total Solids	pH	Soluble Solids (°Brix)
Row 1 #12	6.3	26.4	3.7	21.4
Row 4 #10	9.5	23.1	3.9	17.4
Row 6 #5	9.3	23.8	4	16.7
Row 7 #38	9.3	NA[1]	3.7	22
Row 7 #46	5.9	NA	3.7	18.2
Row 8 #39	7.1	30.1	3.6	23.2
Row 13 #21	6.2	27.1	3.7	22.7
Row 13 #39	5	30.3	3.7	21.3
Row 15 #31	4.1	28.9	3.8	21.9
Population Mean	7.0	27.1	3.7	20.5
(Population Std. Dev.)	(1.86)	(2.67)	(0.10)	(2.29)

[1] NA=Not available due to insufficient amount of sample.
[2] Analysis was not performed in duplicate due to limited amount of sample.
Shaded values indicate the minimum or maximum value within a column.

Table 9. Fruit Characteristics of saskatoon cultivars harvested in 1999 from Moon Lake and Saskatoon.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	pH	Soluble Solids (°Brix)	Total Titratable Acidity (% Malic Acid)	L Value	Hue Angle	Chroma
Bluff	Moon Lake	9.1[1](0.56)[2]	22.1 (0.56)	4.0 (0.04)	15.3 (0.18)	NA	13.5 (1.43)	16.5 (0.82)	22.8 (2.98)
	Saskatoon	8.3 (0.13)	19.8 (0.26)	3.9 (0.05)	13.2 (0.26)	0.49 (0.053)	15.3 (1.40)	18.1 (0.42)	24.1 (1.97)
		8.7[3](0.03)[4]	21.0 (0.59)	3.9 (0.03)	14.2 (0.49)	NA	14.4 (0.98)	17.3 (0.55)	23.4 (1.62)

Buffalo	Moon Lake	10.0 (0.51)	22.1 (0.36)	3.9 (0.05)	15.6 (0.42)	NA	12.6 (0.34)	16.0 (0.16)	23.2 (1.10)
	Saskatoon	8.8 (0.27)	21.1 (0.60)	4.0 (0.06)	14.3 (0.87)	0.40 (0.020)	15.1 (1.54)	17.2 (0.93)	24.8 (1.34)
		9.4 (0.37)	21.6 (0.39)	3.9 (0.04)	15.0 (0.52)	NA	13.9 (0.90)	16.6 (0.50)	24.0 (0.86)
Forestburg	Moon Lake	11.3 (0.73)	19.2 (0.68)	4.1 (0.02)	13.6 (0.27)	NA	19.2 (0.51)	19.5 (0.40)	27.2 (0.15)
	Saskatoon	10.5 (0.40)	19.4 (0.25)	4.1 (0.01)	12.8 (0.15)	0.30 (0.008)	19.9 (0.15)	22.6 (1.26)	25.5 (0.67)
		10.9 (0.41)	19.3 (0.33)	4.1 (0.01)	13.2 (0.23)	NA	19.6 (0.28)	21.1 (0.91)	26.3 (0.49)
Honeywood	Moon Lake	10.3 (0.54)	19.4 (0.74)	4.0 (0.05)	13.4 (0.66)	NA	19.2 (0.62)	20.2 (0.88)	27.0 (0.23)
	Saskatoon	10.2 (0.54)	20.4 (1.32)	4.2 (0.02)	12.5 (0.30)	0.29 (0.005)	20.2 (1.38)	24.3 (3.00)	24.8 (0.84)
		10.2 (0.33)	19.9 (0.72)	4.1 (0.04)	13.0 (0.38)	NA	19.7 (0.71)	22.3 (1.67)	25.9 (0.62)
Martin	Moon Lake	16.0 (0.70)	22.8 (0.10)	3.7 (0.03)	16.5 (0.47)	NA	20.3 (1.67)	17.1 (0.16)	32.6 (1.26)
	Saskatoon	17.1 (0.59)	20.7 (0.48)	3.7 (0.01)	15.2 (0.40)	0.51 (0.029)	20.5 (0.64)	17.3 (0.19)	32.4 (0.24)
		16.6 (0.48)	21.8 (0.50)	3.7 (0.02)	15.9 (0.40)	NA	20.4 (0.80)	17.2 (0.11)	32.5 (0.58)
Nelson	Moon Lake	12.7 (0.34)	23.7 (1.06)	3.6 (0.01)	17.2 (0.74)	NA	16.4 (0.27)	16.9 (0.07)	31.3 (0.94)
	Saskatoon	11.4 (0.91)	24.3 (1.30)	3.7 (0.01)	17.3 (0.95)	0.57 (0.051)	16.7 (0.18)	17.2 (0.14)	31.3 (0.37)
		12.0 (0.53)	24.0 (0.76)	3.7 (0.01)	17.2 (0.54)	NA	16.6 (0.16)	17.0 (0.09)	31.3 (0.45)
Northline	Moon Lake	11.6 (0.25)	26.8 (3.55)	3.7 (0.05)	17.6 (0.47)	NA	14.7 (0.53)	16.4 (0.32)	27.7 (0.54)
	Saskatoon	10.1 (0.53)	22.2 (0.55)	3.9 (0.04)	14.6 (0.21)	0.50 (0.050)	17.3 (0.18)	18.1 (0.34)	29.0 (0.91)
		10.8 (0.43)	24.5 (1.91)	3.8 (0.06)	16.1 (0.71)	NA	16.0 (0.63)	17.3 (0.44)	28.3 (0.56)
PAR90TRS	Moon Lake	16.7 (0.47)	21.7 (0.36)	3.6 (0.00)	15.3 (0.21)	NA	18.8 (0.77)	17.0 (0.24)	32.1 (1.51)
	Saskatoon	15.8 (1.52)	21.0 (0.88)	3.8 (0.04)	14.4 (0.43)	0.54 (0.010)	19.7 (1.12)	17.7 (0.41)	31.2 (0.92)
		16.2 (0.74)	21.4 (0.45)	3.7 (0.04)	14.8 (0.30)	NA	19.3 (0.64)	17.3 (0.26)	31.7 (0.82)
Parkhill	Moon Lake	12.0 (0.31)	21.6 (0.06)	4.1 (0.07)	16.0 (0.63)	NA	16.0 (0.49)	17.7 (0.63)	26.1 (0.42)
	Saskatoon	11.1 (0.80)	22.2 (1.91)	4.2 (0.02)	16.8 (1.53)	0.31 (0.012)	14.2 (2.44)	17.0 (0.78)	22.4 (2.87)
		15.5 (0.43)	21.9 (0.90)	4.1 (0.04)	16.4 (0.76)	NA	15.1 (1.19)	17.4 (0.47)	24.2 (1.54)
Pasture	Moon Lake	NA	NA	NA	NA	NA	NA	NA	NA
	Saskatoon	17.8 (1.38)	21.1 (0.47)	3.8 (0.03)	15.4 (0.44)	0.48 (0.010)	23.8 (0.65)	16.4 (0.39)	31.2 (0.51)
		17.8 (1.38)	21.1 (0.47)	3.8 (0.03)	15.4 (0.44)	NA	23.8 (0.65)	16.4 (0.39)	31.2 (0.51)
PearsonII	Moon Lake	10.3 (0.38)	20.1 (0.62)	4.1 (0.03)	13.6 (0.55)	NA	19.3 (0.66)	18.6 (1.29)	27.6 (0.40)
	Saskatoon	10.3 (0.55)	18.5 (0.43)	4.2 (0.03)	12.9 (0.39)	0.29 (0.008)	21.4 (0.99)	24.8 (2.14)	25.3 (0.55)
		10.3 (0.30)	19.3 (0.49)	4.2 (0.02)	13.3 (0.34)	NA	20.3 (0.71)	21.7 (1.79)	26.5 (0.59)

Pembina	Moon Lake	9.9 (0.83)	25.6 (0.42)	3.8 (0.03)	16.6 (0.35)	NA	19.9 (1.90)	19.2 (0.38)	29.3 (2.23)
	Saskatoon	9.9 (0.44)	24.2 (1.51)	3.9 (0.04)	15.4 (0.78)	0.62 (0.006)	19.2 (1.21)	19.3 (0.65)	28.9 (1.97)
		9.9 (0.42)	24.9 (0.77)	3.9 (0.02)	16.0 (0.47)	NA	19.6 (1.02)	19.2 (0.33)	29.1 (1.33)
Quaker	Moon Lake	14.0 (0.04)	21.8 (0.17)	3.8 (0.06)	15.6 (0.27)	NA	18.2 (1.04)	17.3 (0.14)	31.0 (1.87)
	Saskatoon	12.1 (0.86)	19.2 (0.38)	3.8 (0.03)	12.3 (0.35)	0.50 (0.006)	22.3 (1.48)	18.5 (0.65)	31.2 (0.57)
		13.0 (0.57)	20.5 (0.61)	3.8 (0.03)	14.0 (0.76)	NA	20.3 (1.21)	17.9 (0.40)	31.1 (0.88)
Regent	Moon Lake	11.4 (0.86)	22.1 (0.27)	4.0 (0.06)	15.9 (0.15)	NA	15.8 (0.65)	17.3 (0.34)	26.7 (0.50)
	Saskatoon	11.3 (0.47)	20.8 (1.28)	4.1 (0.08)	16.0 (0.52)	0.30 (0.011)	14.5 (2.20)	16.3 (0.95)	22.8 (3.54)
		11.4 (0.44)	21.4 (0.66)	4.0 (0.05)	16.0 (0.24)	NA	15.1 (1.06)	16.8 (0.50)	24.8 (1.81)
Smoky	Moon Lake	11.5 (0.21)	21.0 (0.52)	4.1 (0.02)	15.0 (0.70)	NA	16.8 (1.64)	17.8 (0.43)	26.1 (1.10)
	Saskatoon	9.9 (0.17)	18.4 (0.35)	4.1 (0.08)	12.1 (0.15)	0.28 (0.003)	21.7 (0.82)	24.1 (1.18)	25.9 (0.30)
		10.7 (0.37)	19.7 (0.64)	4.1 (0.04)	13.6 (0.73)	NA	19.2 (1.37)	21.0 (1.51)	26.0 (0.51)
Success	Moon Lake	9.2 (0.39)	22.5 (0.29)	4.0 (0.02)	15.6 (0.20)	NA	16.3 (1.44)	20.2 (0.94)	24.1 (0.70)
	Saskatoon	9.9 (0.15)	20.9 (0.91)	4.0 (0.08)	13.8 (0.23)	0.28 (0.007)	18.2 (1.11)	23.8 (2.53)	23.2 (0.52)
		9.6 (0.23)	21.7 (0.56)	4.0 (0.04)	14.7 (0.41)	NA	17.2 (0.91)	22.0 (1.44)	23.7 (0.43)
Thiessen	Moon Lake	17.2 (0.10)	20.5 (0.36)	3.7 (0.03)	14.5 (0.23)	NA	21.2 (0.41)	17.3 (0.51)	33.3 (0.47)
	Saskatoon	16.2 (0.83)	20.4 (0.55)	3.7 (0.12)	14.1 (0.38)	0.53 (0.015)	22.3 (1.16)	17.5 (0.57)	31.8 (1.02)
		16.7 (0.44)	20.5 (0.30)	3.7 (0.06)	14.3 (0.22)	NA	21.8 (0.60)	17.4 (0.35)	32.5 (0.60)
Population Mean (Population Std. Dev.)		11.9 (2.86)	21.4 (2.34)	3.9 (0.19)	14.9 (1.67)	0.42 (0.121)	18.2 (3.25)	18.6 (2.85)	27.7 (3.88)

[1] Unless otherwise noted, refers to the mean of three replicated plants within a site.
[2] Standard error of the replicate mean.
[3] Mean of all replicates collected for a particular cultivar.
[4] Standard error of cultivar mean.
Shaded values indicate the minimum or maximum value within a column.

Table 10. Statistical comparison of fruit characteristics of saskatoon cultivars harvested from Moon Lake and Saskatoon in 1999[1].

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean pH	Mean Soluble Solids (°Brix)	Mean Total Titrable Acidity (% Malic Acid)	Mean Hue Angle (°)	Mean Chroma
Bluff	8.7 i[2]	21.0 bcde	4.0 de	14.2 efg	0.49 c	17.3 cd	23.5 g
Buffalo	9.4 hi	21.6 bcd	4.0 de	15.0 cde	0.40 d	16.6 d	24.0 efg
Forestburg	10.9 cdef	19.3 e	4.1 ab	13.2 gh	0.30 e	21.0 ab	26.4 def
Honeywood	10.2 efgh	19.9 cde	4.1 abc	13.0 h	0.30 e	22.3 a	25.9 defg
Martin	16.6 a	21.8 bc	3.7 ghi	15.9 bcd	0.51 bc	17.2 cd	32.5 a
Nelson	12.0 bc	24.0 a	3.7 i	17.2 a	0.57 ab	17.0 d	31.3 ab
Northline	10.8 def	24.5 a	3.8 fgh	16.1 b	0.50 c	17.3 cd	28.3 cd
PAR90TRS	16.2 a	21.4 bcd	3.7 hi	14.8 de	0.54 bc	17.3 cd	31.7 ab
Parkhill	11.5 cd	21.9 b	4.1 ab	16.4 ab	0.31 e	17.4 cd	24.3 efg
PearsonII	10.3 efgh	19.3 e	4.2 a	13.3 fgh	0.29 e	21.7 a	26.5 cde
Pembina	9.9 fgh	24.9 a	3.9 ef	16.0 bc	0.62 a	19.2 bc	29.1 bc
Quaker	13.0 b	20.5 bcde	3.8 fg	14.0 efgh	0.50 c	17.9 cd	31.1 ab
Regent	11.4 cde	21.4 bcd	4.0 bcd	16.0 bc	0.30 e	16.8 d	24.8 efg
Smoky	10.7 defg	19.7 de	4.1 ab	13.6 fgh	0.28 e	21.0 ab	26.0 defg
Success	9.6 ghi	21.7 bc	4.0 cd	14.7 e	0.28 e	22.0 a	23.7 fg
Thiessen	16.7 a	20.5 bcde	3.7 ghi	14.3 ef	0.53 bc	17.4 cd	32.5 a

[1] The cultivar Pasture was excluded from the analysis since it is not replicated at Moon Lake.
[2] Values with the same letter within a column are not significantly different (<0.05).
Shaded values indicate the minimum or maximum value within a column.

Table 11. The amount of juice extracted from 25 g of saskatoon fruit harvested in 1999 from Moon Lake and Saskatoon.

Cultivar[1]	Location	Juice Extracted (mL)
Bluff	Moon Lake	12.0[1]
	Saskatoon	10.8[2](1.25)
		NA
Buffalo	Moon Lake	13.0[2](0.00)
	Saskatoon	NA
		NA
Forestburg	Moon Lake	13.3 (0.17)
	Saskatoon	12.0 (0.29)
		12.7 (0.33)
Honeywood	Moon Lake	13.3 (0.17)
	Saskatoon	12.2 (0.33)
		12.8 (0.31)
Martin	Moon Lake	13.2 (0.33)
	Saskatoon	13.5 (0.50)
		13.3 (0.28)
Nelson	Moon Lake	13.0 (0.50)
	Saskatoon	12.8[2](0.75)
		NA
Northline	Moon Lake	12.0[1]
	Saskatoon	11.5[1]
		NA
PAR90TRS	Moon Lake	13.8 (0.67)
	Saskatoon	13.0 (0.29)
		13.4 (0.37)
Parkhill	Moon Lake	14.0 (0.29)
	Saskatoon	12.5 (1.53)
		13.3 (0.77)
Pasture	Moon Lake	NA
	Saskatoon	13.7 (0.33)
		NA
PearsonII	Moon Lake	13.7 (0.17)
	Saskatoon	12.5 (0.58)
		13.1 (0.37)
Pembina	Moon Lake	8.3[2](0.25)
	Saskatoon	7.5[1]
		NA
Quaker	Moon Lake	12.7 (0.33)
	Saskatoon	13.5 (0.29)
		13.1 (0.27)
Regent	Moon Lake	12.8 (0.73)
	Saskatoon	14.2 (0.44)
		NA
Smoky	Moon Lake	12.0 (0.50)
	Saskatoon	12.2 (0.17)
		12.1 (0.24)
Success	Moon Lake	11.8 (0.17)
	Saskatoon	11.0 (0.50)
		11.4 (030)
Thiessen	Moon Lake	14.7 (0.44)
	Saskatoon	13.0 (0.29)
		13.8 (0.44)
Population Mean		12.7
(Population Std. Dev.)		(1.44)

[1] Only one replicate available due to other replicates overloading the equipment
[2] Only two replicates available due to the other replicate overloading the equipment.
Note: Equipment overload occurred because the force required to compress the sample to 90% of its original height was greater than the force the load cell could exert. Differences in fruit firmness, amount of seed present, seed size, and/or density of the fruit may have been responsible for equipment overload.
Shaded values indicate the minimum or maximum value.

Table 12. Statistical comparison of juice extracted volume from saskatoon cultivars harvested from Moon Lake and Saskatoon in 1999.

Cultivar	Mean Juice Extracted (mL)	Cultivar	Mean Juice Extracted (mL)
Forestburg	12.7 bc[1]	Quaker	13.1 abc
Honeywood	12.8 bc	Regent	13.5 ab
Martin	13.3 ab	Smoky	12.1 cd
PAR90TRS	13.4 ab	Success	11.4 d
Parkhill	13.3 ab	Thiessen	13.8 a
PearsonII	13.1 abc		

[1]Values with the same letter within a the table are not significantly different (<0.05).
Shaded values indicate the minimum or maximum value.

Table 13. Anthocyanin composition and content of saskatoon cultivars harvested from the Saskatoon site in 1999.

Cultivar	Peak	Anthocyanin	Retention Time (min)	% of Total Area	Amount (μg/g)[1]	Total Amount (μg/g)[1]
Bluff	1	Cyn-3-Gal	9.7[2](0.13)[3]	65.5 (0.81)	417.1 (11.76)	
	2	Cyn-3-Glu	10.8 (0.11)	18.7 (0.55)	144.1 (1.17)	
	3	Unknown 1	11.5 (0.11)	9.7 (0.14)	88.1 (2.09)	
	4	Unknown 2	14.2 (0.11)	6.1 (0.14)	66.5 (1.41)	716.8 (16.67)
Buffalo	1	Cyn-3-Gal	10.1 (0.07)	59.7 (0.27)	343.5 (26.79)	
	2	Cyn-3-Glu	11.1 (0.06)	23.2 (0.24)	154.4 (9.19)	
	3	Unknown 1	11.8 (0.06)	9.1 (0.09)	78.1 (4.32)	
	4	Unknown 2	14.5 (0.07)	8.0 (0.19)	72.5 (2.36)	648.4 (42.59)
Forestburg	1	Cyn-3-Gal	10.2 (0.06)	62.1 (0.88)	207.0 (10.37)	
	2	Cyn-3-Glu	11.2 (0.06)	20.8 (0.48)	93.2 (1.59)	
	3	Unknown 1	11.9 (0.06)	10.1 (0.34)	59.3 (0.43)	
	4	Unknown 2	14.6 (0.06)	6.9 (0.12)	50.3 (0.61)	409.8 (12.79)
Honeywood	1	Cyn-3-Gal	9.8 (0.15)	65.5 (0.42)	213.2 (9.71)	
	2	Cyn-3-Glu	10.9 (0.12)	19.0 (0.35)	87.3 (3.07)	
	3	Unknown 1	11.6 (0.12)	9.1 (0.11)	55.8 (1.29)	
	4	Unknown 2	14.3 (0.13)	6.4 (0.03)	48.5 (1.03)	404.8 (14.85)
Martin	1	Cyn-3-Gal	9.8 (0.16)	66.6 (0.32)	335.0 (22.98)	
	2	Cyn-3-Glu	10.8 (0.13)	19.6 (0.24)	123.3 (7.35)	
	3	Unknown 1	11.5 (0.13)	8.0 (0.08)	66.9 (2.66)	
	4	Unknown 2	14.3 (0.13)	5.8 (0.04)	57.2 (2.01)	582.4 (34.85)
Nelson	1	Cyn-3-Gal	9.9 (0.14)	66.0 (1.06)	478.3 (23.83)	
	2	Cyn-3-Glu	10.9 (0.12)	18.8 (0.73)	161.8 (13.81)	
	3	Unknown 1	11.6 (0.11)	9.3 (0.10)	94.1 (5.02)	
	4	Unknown 2	14.3 (0.12)	5.9 (0.24)	70.9 (4.54)	805.0 (47.14)

Northline	1	Cyn-3-Gal	10.1 (0.10)	79.4 (0.22)	489.5 (10.80)	
	2	Cyn-3-Glu	11.1 (0.09)	9.3 (0.10)	88.2 (1.51)	
	3	Unknown 1	11.8 (0.09)	6.7 (0.17)	69.6 (0.56)	
	4	Unknown 2	14.5 (0.09)	4.6 (0.12)	57.2 (1.33)	704.5 (13.54)
PAR90TRS	1	Cyn-3-Gal	9.7 (0.15)	64.7 (0.14)	365.3 (27.56)	
	2	Cyn-3-Glu	10.8 (0.13)	21.1 (0.33)	141.9 (7.11)	
	3	Unknown 1	11.3 (0.03)	7.8 (0.27)	71.3 (4.65)	
	4	Unknown 2	14.2 (0.13)	6.4 (0.08)	63.6 (2.24)	642.1 (41.49)
Parkhill	1	Cyn-3-Gal	10.0 (0.18)	64.8 (0.22)	292.5 (13.48)	
	2	Cyn-3-Glu	11.0 (0.15)	20.2 (0.27)	115.3 (2.84)	
	3	Unknown 1	11.7 (0.15)	8.3 (0.33)	64.3 (2.75)	
	4	Unknown 2	14.4 (0.15)	6.7 (0.15)	57.5 (0.83)	529.5 (19.71)
Pasture	1	Cyn-3-Gal	9.7 (0.08)	62.4 (0.40)	274.3 (30.36)	
	2	Cyn-3-Glu	10.8 (0.07)	21.5 (0.41)	117.8 (10.79)	
	3	Unknown 1	11.5 (0.07)	9.7 (0.57)	67.8 (2.80)	
	4	Unknown 2	14.2 (0.07)	6.4 (0.22)	55.8 (3.26)	515.7 (46.90)
PearsonII	1	Cyn-3-Gal	10.0 (0.16)	63.2 (0.74)	215.4 (8.33)	
	2	Cyn-3-Glu	11.0 (0.13)	20.2 (0.50)	93.4 (4.57)	
	3	Unknown 1	11.7 (0.13)	10.0 (0.13)	59.9 (1.83)	
	4	Unknown 2	14.4 (0.13)	6.7 (0.14)	50.1 (1.49)	418.8 (16.12)
Pembina	1	Cyn-3-Gal	9.8 (0.12)	62.2 (0.43)	173.9 (14.82)	
	2	Cyn-3-Glu	10.8 (0.10)	21.8 (0.26)	84.6 (5.73)	
	3	Unknown 1	11.5 (0.10)	8.6 (0.16)	50.4 (2.26)	
	4	Unknown 2	14.3 (0.10)	7.5 (0.16)	47.7 (1.54)	356.6 (24.25)
Quaker	1	Cyn-3-Gal	9.8 (0.10)	64.1 (0.15)	367.5 (45.11)	
	2	Cyn-3-Glu	10.8 (0.09)	20.5 (0.12)	140.9 (13.32)	
	3	Unknown 1	11.5 (0.08)	9.0 (0.10)	77.9 (6.07)	
	4	Unknown 2	14.3 (0.09)	6.4 (0.08)	64.1 (4.34)	650.4 (68.80)
Regent	1	Cyn-3-Gal	9.8 (0.12)	65.2 (0.91)	313.1 (25.43)	
	2	Cyn-3-Glu	10.8 (0.09)	20.3 (0.67)	122.3 (11.61)	
	3	Unknown 1	11.5 (0.09)	7.9 (0.06)	64.9 (3.58)	
	4	Unknown 2	14.2 (0.08)	6.7 (0.24)	59.7 (3.98)	560.0 (44.56)
Smoky	1	Cyn-3-Gal	10.0 (0.11)	63.8 (0.71)	210.7 (7.80)	
	2	Cyn-3-Glu	11.0 (0.10)	19.7 (0.53)	89.9 (4.18)	
	3	Unknown 1	11.7 (0.10)	9.8 (0.15)	58.3 (1.50)	
	4	Unknown 2	14.4 (0.10)	6.7 (0.14)	49.5 (1.37)	408.4 (14.69)
Success	1	Cyn-3-Gal	9.9 (0.17)	68.6 (0.25)	271.4 (22.49)	
	2	Cyn-3-Glu	10.9 (0.12)	17.8 (0.12)	96.5 (5.26)	
	3	Unknown 1	11.7 (0.11)	6.8 (0.06)	54.4 (2.24)	
	4	Unknown 2	14.4 (0.11)	6.8 (0.16)	54.3 (1.62)	476.6 (31.60)
Thiessen	1	Cyn-3-Gal	9.8 (0.14)	66.7 (0.88)	297.7 (17.01)	
	2	Cyn-3-Glu	10.9 (0.12)	19.6 (0.46)	112.2 (5.18)	
	3	Unknown 1	11.6 (0.11)	7.9 (0.56)	62.5 (4.44)	
	4	Unknown 2	14.3 (0.11)	5.8 (0.15)	54.0 (1.61)	526.4 (27.46)

[T] Amount of unknowns calculated as cyanidin-3-galactoside.

[2] Mean of three replicates.
[3] Standard error of the replicate mean.
Shaded values indicate the minimum or maximum value within a column for each peak.

Table 14. Statistical comparison of anthocyanin contents of saskatoon cultivars harvested from the Saskatoon site in 1999.

Cultivar	Peak 1 Cyanidin-3-Galactoside (μg/g)	Peak2 Cyanidin-3-Glucoside (μg/g)	Peak 3 Unidentified (μg/g)[1]	Peak 4 Unidentified (μg/g)[1]	Total Amount (μg/g)[1]
Bluff	417.1[2](11.76)[3]bc[4]	144.1 (1.17) ab	88.1 (2.09) a	66.5 (1.41) abc	716.8 (16.67) ab
Buffalo	343.5 (26.79) de	154.4 (9.19) a	78.1 (4.32) b	72.5 (2.36) a	648.4 (42.59) bc
Forestburg	207.0 (10.37) h	93.2 (1.59) ef	59.3 (0.43) defg	50.3 (0.61) fgh	409.8 (12.79) gh
Honeywood	213.2 (9.71) gh	87.3 (3.07) f	55.8 (1.29) efg	48.5 (1.03) h	404.8 (14.85) gh
Martin	335.0 (22.98) def	123.3 (7.35) bc	66.9 (2.66) cd	57.2 (2.01) def	582.4 (34.85) cd
Nelson	478.3 (23.83) ab	161.8 (13.81) a	94.1 (5.02) a	70.9 (4.54) a	805.0 (47.14) a
Northline	489.5 (10.80) a	88.2 (1.51) f	69.6 (0.56) bc	57.2 (1.33) def	704.5 (13.54) ab
PAR90TRS	365.3 (27.56) cd	141.9 (7.11) ab	71.3 (4.65) bc	63.6 (2.24) cd	642.1 (41.49) bc
Parkhill	292.5 (13.48) ef	115.3 (2.84) cde	64.3 (2.75) cde	57.5 (0.83) de	529.5 (19.71) de
Pasture	274.3 (30.36) fg	117.8 (10.79) cd	67.8 (2.80) cd	55.8 (3.26) efg	515.7 (46.90) def
PearsonII	215.4 (8.33) gh	93.4 (4.57) ef	59.9 (1.83) defg	50.1 (1.49) gh	418.8 (16.12) fgh
Pembina	173.9 (14.82) h	84.6 (5.73) f	50.4 (2.26) g	47.7 (1.54) g	356.6 (24.25) h
Quaker	367.5 (45.11) cd	140.9 (13.32) ab	77.9 (6.07) b	64.1 (4.34) bcd	650.4 (68.80) bc
Regent	313.1 (25.43) def	122.3 (11.61) bc	64.9 (3.58) cde	59.7 (3.98) cde	560.0 (44.56) cde
Smoky	210.7 (7.80) gh	89.9 (4.18) f	58.3 (1.50) defg	49.5 (1.37) gh	408.4 (14.69) gh
Success	271.4 (22.49) fg	96.5 (5.26) def	54.4 (2.24) fg	54.3 (1.62) efgh	476.6 (31.60) efg
Thiessen	297.7 (17.01) ef	112.2 (5.18) cde	62.5 (4.44) cdef	54.0 (1.61) efgh	526.4 (27.46) de
Pop. Mean	309.8	115.7	67.3	57.6	550.36
Std Error	22.24	7.73	3.35	2.45	35.17
LSD[5]	64.07	22.28	9.65	7.07	101.3

[1] Amount of unknowns calculated as cyanidin-3-galactoside.
[2] Mean of three replicates.
[3] Standard error of the replicate mean.
[4] Values in with the same letter in a column are not significantly different ($p<0.05$).
[5] Least significant difference ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 15. Fruit Characteristics of saskatoon cultivars harvested in 2000 from Moon Lake and Saskatoon.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	pH	Soluble Solids (°Brix)	Total Titratable Acidity (% Malic Acid)	L Value	Hue Angle	Chroma
Bluff	Moon Lake	8.3[1](0.43)[2]	20.2 (0.30)	4.0 (0.01)	15.0 (0.24)	NA	15.7 (0.30)	18.1 (0.20)	28.7 (0.54)
	Saskatoon	7.8 (0.35)	21.4 (0.50)	4.0 (0.00)	16.6 (0.17)	0.43 (0.005)	14.7 (0.25)	17.2 (0.17)	27.9 (0.58)
		8.1[3](0.27)[4]	20.8 (0.37)	4.0 (0.01)	15.8 (0.38)	NA	15.2 (0.27)	17.7 (0.24)	28.3 (0.39)
Buffalo	Moon Lake	10.1 (0.58)	23.0 (0.33)	3.9 (0.01)	18.2 (0.55)	NA	14.3 (0.64)	16.8 (0.24)	29.8 (1.04)
	Saskatoon	9.6 (0.50)	23.3 (0.48)	4.1 (0.05)	18.4 (0.48)	0.44 (0.012)	17.7 (0.46)	17.1 (0.32)	32.0 (0.69)
		9.9 (0.36)	23.2 (0.27)	4.0 (0.04)	18.3 (0.33)	NA	16.0 (0.82)	17.0 (0.20)	30.9 (0.74)
Forestburg	Moon Lake	12.0 (0.29)	20.5 (0.50)	4.2 (0.02)	17.0 (0.32)	NA	20.6 (1.89)	20.7 (1.91)	29.2 (0.56)
	Saskatoon	10.6 (0.27)	22.6 (0.21)	4.2 (0.03)	17.8 (0.33)	0.38 (0.067)	17.9 (1.77)	17.5 (0.24)	30.5 (0.56)
		11.3 (0.35)	21.5 (0.52)	4.2 (0.03)	17.4 (0.28)	NA	19.2 (1.31)	19.1 (1.11)	29.8 (0.45)
Honeywood	Moon Lake	11.0 (0.40)	21.7 (0.90)	4.2 (0.03)	17.6 (0.61)	NA	18.7 (1.46)	18.7 (0.29)	30.1 (0.89)
	Saskatoon	10.2 (0.69)	23.1 (0.85)	4.2 (0.02)	18.6 (0.35)	0.33 (0.006)	16.1 (0.64)	17.4 (0.24)	28.0 (0.69)
		10.6 (0.40)	22.4 (0.63)	4.2 (0.02)	18.1 (0.38)	NA	17.4 (0.92)	18.0 (0.33)	29.0 (0.69)
Martin	Moon Lake	18.1 (0.65)	19.9 (0.43)	3.7 (0.01)	15.7 (0.37)	NA	22.2 (1.41)	18.5 (0.11)	36.3 (0.43)
	Saskatoon	15.6 (0.45)	21.5 (0.40)	3.8 (0.01)	15.6 (0.26)	0.52 (0.009)	24.3 (0.58)	19.0 (0.26)	35.0 (0.35)
		16.9 (0.66)	20.7 (0.44)	3.7 (0.04)	15.6 (0.20)	NA	23.2 (0.83)	18.8 (0.17)	35.7 (0.40)
Nelson	Moon Lake	9.8 (0.71)	23.6 (0.61)	3.7 (0.03)	18.8 (0.72)	NA	17.8 (1.20)	17.9 (0.53)	33.7 (1.33)
	Saskatoon	8.2 (0.33)	24.8 (0.58)	3.7 (0.00)	18.9 (0.54)	0.64 (0.015)	14.8 (0.85)	17.2 (0.71)	29.6 (1.31)
		9.0 (0.50)	24.2 (0.45)	3.7 (0.02)	18.9 (0.40	NA	16.3 (0.93)	17.6 (0.43)	31.7 (1.25)
Northline	Moon Lake	11.6 (1.03)	26.8 (3.55)	3.8 (0.00)	18.3 (0.20)	NA	18.9 (1.92)	19.1 (0.79)	31.8 (0.77)
	Saskatoon	11.3 (0.50)	23.4 (0.42)	3.8 (0.01)	18.1 (0.18)	0.51 (0.021)	19.5 (0.61)	17.9 (0.28)	34.4 (0.75)
		11.5 (0.50)	23.8 (0.46)	3.8 (0.01)	18.2 (0.13)	NA	19.2 (0.91)	18.5 (0.46)	33.1 (0.75)
PAR90TRS	Moon Lake	16.7 (0.66)	19.2 (0.32)	3.6 (0.01)	15.2 (0.29)	NA	20.9 (0.26)	19.0 (0.14)	35.4 (0.41)
	Saskatoon	14.9 (0.39)	22.7 (0.45)	3.8 (0.00)	15.5 (0.26)	0.52 (0.006)	22.4 (0.64)	18.8 (0.26)	34.4 (0.46)
		15.8 (0.53)	19.9 (0.41)	3.7 (0.03)	15.4 (0.19)	NA	21.6 (0.46)	18.9 (0.14)	34.9 (0.35)
Parkhill	Moon Lake	10.7 (0.70)	22.7 (0.45)	4.2 (0.02)	18.2 (0.20)	NA	16.3 (1.03)	17.6 (0.44)	29.7 (0.64)
	Saskatoon	8.8 (0.34)	22.9 (1.21)	4.3 (0.02)	18.9 (0.88)	0.33 (0.013)	15.0 (1.85)	17.2 (0.77)	27.2 (2.26)
		9.7 (0.55)	22.8 (0.58)	4.2 (0.02)	18.5 (0.43)	NA	15.7 (0.99)	17.4 (0.40)	28.4 (1.19)

Pasture	Moon Lake	NA[5]	NA	NA	NA	NA	NA	NA	NA
	Saskatoon	13.3 (0.40)	19.1 (0.17)	3.9 (0.02)	14.4 (0.27)	0.45 (0.012)	25.0 (0.91)	19.5 (0.59)	32.8 (0.55)
		13.3 (0.40)	19.1 (0.17)	3.9 (0.02)	14.4 (0.27)	NA	25.0 (0.91)	19.5 (0.59)	32.8 (0.55)
PearsonII	Moon Lake	10.6 (0.73)	23.0 (0.06)	4.1 (0.02)	18.1 (0.03)	NA	17.2 (0.93)	18.8 (0.98)	28.9 (1.24)
	Saskatoon	10.4 (0.18)	23.2 (0.52)	4.2 (0.01)	18.7 (0.18)	0.31 (0.006)	16.1 (1.23)	17.2 (0.07)	30.4 (0.41)
		10.5 (0.34)	23.1 (0.24)	4.2 (0.02)	18.4 (0.16)	NA	16.6 (0.73)	18.0 (0.57)	29.6 (0.68)
Pembina	Moon Lake	8.0 (0.26)	27.8 (1.03)	3.8[6](0.03)	20.5[6](0.25)	NA	16.5[6](0.50)	18.4[6](0.36)	29.9[6](0.26)
	Saskatoon	6.4[6](0.37)	28.5[6](0.21)	4.2[6](0.20)	22.3[6](1.30)	NA	9.5[7] (NA)	15.7[7] (NA)	17.7[7](1.97)
		7.4 (0.43)	28.1 (0.60)	4.0 (0.14)	21.4 (0.76)	NA	14.2 (2.35)	17.5 (0.92)	25.8 (4.09)
Quaker	Moon Lake	13.5 (0.48)	18.8 (0.23)	3.8 (0.04)	14.4 (0.13)	NA	22.7 (1.49)	19.5 (0.58)	34.2 (0.77)
	Saskatoon	11.9 (0.62)	20.1 (0.72)	3.8 (0.04)	14.3 (0.32)	0.49 (0.021)	22.2 (1.30)	18.8 (0.26)	33.6 (0.24)
		12.7 (0.51)	19.4 (0.45)	3.8 (0.03)	14.3 (0.16)	NA	22.5 (0.89)	19.1 (0.33)	33.9 (0.38)
Regent	Moon Lake	9.1 (0.27)	23.2 (0.46)	4.1 (0.03)	19.0 (0.19)	NA	17.3 (0.65)	17.9 (0.14)	30.9 (0.62)
	Saskatoon	8.4 (0.34)	21.8 (1.57)	4.2 (0.02)	17.9 (0.84)	0.30 (0.023)	15.1 (1.29)	17.6 (0.29)	27.9 (1.60)
		8.7 (0.25)	22.5 (0.79)	4.2 (0.03)	18.5 (0.46)	NA	16.2 (0.81)	17.7 (0.16)	29.4 (1.01)
Smoky	Moon Lake	10.9 (0.15)	21.6 (1.34)	4.2 (0.03)	17.2 (0.87)	NA	19.4 (1.24)	20.0 (0.64)	29.5 (0.47)
	Saskatoon	10.1 (0.36)	25.2 (0.86)	4.2 (0.01)	19.4 (0.47)	0.34 (0.005)	15.0 (0.85)	16.8 (0.28)	27.4 (1.38)
		10.6 (0.24)	23.4 (1.07)	4.2 (0.02)	18.3 (0.66)	NA	17.2 (1.19)	18.4 (0.78)	28.4 (0.80)
Success	Moon Lake	7.7 (0.35)	21.8 (0.24)	4.1 (0.04)	15.6 (0.23)	NA	14.9 (0.53)	19.9 (0.31)	25.0 (0.60)
	Saskatoon	6.4 (0.75)	22.9 (1.22)	4.2 (0.09)	17.5 (1.08)	0.30 (0.010)	13.1 (0.55)	19.3 (0.15)	22.0 (0.89)
		7.1 (0.46)	22.3 (0.60)	4.0 (0.04)	16.5 (0.66)	NA	14.0 (0.52)	19.6 (0.20)	23.5 (0.83)
Thiessen	Moon Lake	16.3 (0.52)	19.9 (0.59)	3.7 (0.04)	15.3 (0.10)	NA	21.4 (0.86)	19.1 (0.33)	34.7 (0.75)
	Saskatoon	14.7 (0.40)	20.5 (0.81)	3.8 (0.04)	15.5 (0.79)	0.44 (0.068)	22.2 (0.31)	18.8 (0.30)	34.5 (0.60)
		15.5 (0.45)	20.2 (0.47)	3.8 (0.04)	15.4 (0.36)	NA	21.8 (0.45)	18.9 (0.21)	34.6 (0.43)
Population Mean		11.0	22.2	4.0	17.3	0.42	18.2	18.3	30.7
(Population Std. Dev.)		(3.00)	(2.35)	(0.22)	(1.93)	(0.104)	(3.63)	(1.28)	(3.72)

[1] Unless otherwise noted, refers to the mean of three replicated plants within a site. [2] Standard error of the replicate mean.
[3] Mean of all replicates collected for a particular cultivar. [4] Standard error of cultivar mean.
[5] Not available. [6] Only two replicates available for analysis.
[7] Only one replicate available for analysis. Shaded values indicate the minimum or maximum value within a column.

Table 16. Statistical comparison of fruit characteristics of saskatoon cultivars harvested from Moon Lake and Saskatoon in 2000[1].

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean pH	Mean Soluble Solids (°Brix)	Mean Total Titratable Acidity (%Malic Acid)	Mean L Value	Mean Hue Angle (°)	Mean Chroma
Bluff	8.1 hi[2]	20.8 fg	4.0 d	15.8 ef	0.43 de	15.2 def	17.7 fg	28.3 f
Buffalo	9.9 fg	23.2 bcd	4.0 d	18.3 bc	0.44 cde	16.0 cde	17.0 g	30.9 de
Forestburg	11.3 de	21.5 ef	4.2 a	17.4 cd	0.38 ef	19.2 b	19.1 abc	29.9 ef
Honeywood	10.6 de	22.4 cde	4.2 c	18.1 bc	0.33 fg	17.4 bc	18.0 cdefg	29.0 f
Martin	16.9 a	20.7 fg	3.7 fg	15.6 ef	0.52 b	23.2 a	18.8 abcde	35.7 a
Nelson	9.0 gh	24.2 b	3.7 g	18.9 b	0.64 a	16.3 cd	17.6 fg	31.7 cd
Northline	11.5 d	23.8 bc	3.8 e	18.2 bc	0.52 bc	19.2 b	18.5 abcde	33.1 bc
PAR90TRS	15.8 b	19.9 g	3.7 g	15.4 f	0.52 b	21.6 a	18.9 abcd	34.9 ab
Parkhill	9.8 fg	22.8 bcde	4.2 a	18.5 b	0.33 fg	15.7 cdef	17.4 fg	28.4 f
PearsonII	10.5 e	23.1 bcd	4.2 c	18.4 b	0.31 fg	16.6 cd	18.0 defg	29.6 ef
Pembina	7.2 ij	28.2 a	4.0 d	21.4 a	NA	13.1 f	17.1 fg	23.8 g
Quaker	12.7 c	19.4 g	3.8 ef	14.3 g	0.49 bcd	22.5 a	19.2 ab	33.9 ab
Regent	8.7 h	22.5 cde	4.2 b	18.5 b	0.30 g	16.2 cd	17.8 efg	29.4 ef
Smoky	10.5 ef	23.4 bcd	4.2 a	18.3 bc	0.34 fg	17.2 bcd	18.4 bcdef	28.4 f
Success	7.1 j	22.3 de	4.2 c	16.5 de	0.30 g	14.0 ef	19.6 a	23.5 g
Thiessen	15.5 b	20.2 fg	3.8 ef	15.4 f	0.44 cde	21.8 a	18.9 abcd	34.6 ab

[1] The cultivar Pasture was excluded from the analysis since it is not replicated at Moon Lake.
[2] Values with the same letter within a column are not significantly different (<0.05).
Shaded values indicate the minimum or maximum value within a column.

Table 17. Anthocyanin composition and content of saskatoon cultivars harvested from the Saskatoon site in 2000.

Cultivar	Peak	Anthocyanin	Retention Time (min)	% of Total Area	Amount (μg/g)[1]	Total Amount (μg/g)[1]
Bluff	1	Cyn-3-Gal	10.0[2](0.18)[3]	64.5 (0.52)	490.5 (10.24)	
	2	Cyn-3-Glu	11.0 (0.15)	19.9 (0.41)	174.7 (1.62)	
	3	Unknown 1	11.7 (0.15)	9.2 (0.08)	95.8 (0.82)	
	4	Unknown 2	14.4 (0.15)	6.5 (0.12)	76.8 (0.24)	837.9 (10.27)
Buffalo	1	Cyn-3-Gal	10.0 (0.18)	62.5 (1.93)	344.8 (24.97)	
	2	Cyn-3-Glu	11.0 (0.16)	21.5 (0.96)	142.7 (13.4)	
	3	Unknown 1	11.7 (0.16)	8.7 (0.64)	75.3 (7.21)	
	4	Unknown 2	14.4 (0.15)	7.3 (0.40)	67.8 (4.95)	630.5 (48.98)
Forestburg	1	Cyn-3-Gal	9.8 (0.03)	59.1 (0.62)	203.4 (6.04)	
	2	Cyn-3-Glu	10.8 (0.03)	23.3 (0.43)	102.0 (1.36)	
	3	Unknown 1	11.5 (0.02)	10.3 (0.16)	60.8 (0.34)	
	4	Unknown 2	14.2 (0.02)	7.4 (0.10)	52.2 (0.35)	418.4 (7.59)
Honeywood	1	Cyn-3-Gal	9.8 (0.01)	62.0 (1.48)	240.8 (6.13)	
	2	Cyn-3-Glu	10.9 (0.01)	21.1 (0.76)	106.0 (6.35)	
	3	Unknown 1	11.6 (0.01)	9.9 (0.42)	64.4 (3.22)	
	4	Unknown 2	14.3 (0.00)	7.1 (0.30)	54.7 (2.32)	465.9 (17.82)
Martin	1	Cyn-3-Gal	10.0 (0.13)	66.7 (0.24)	298.0 (20.22)	
	2	Cyn-3-Glu	11.0 (0.11)	19.1 (0.24)	110.5 (6.78)	
	3	Unknown 1	11.7 (0.11)	7.9 (0.15)	62.0 (2.66)	
	4	Unknown 2	14.4 (0.12)	6.2 (0.05)	55.2 (1.96)	525.7 (31.54)
Nelson	1	Cyn-3-Gal	9.8 (0.02)	65.8 (0.26)	540.0 (22.53)	
	2	Cyn-3-Glu	10.8 (0.02)	19.5 (0.12)	183.9 (6.69)	
	3	Unknown 1	11.6 (0.02)	8.3 (0.11)	94.6 (3.30)	
	4	Unknown 2	14.3 (0.01)	6.4 (0.06)	79.9 (1.92)	898.5 (34.20)
Northline	1	Cyn-3-Gal	9.8 (0.01)	78.6 (0.50)	477.0 (16.00)	
	2	Cyn-3-Glu	10.8 (0.01)	9.6 (0.01)	89.0 (2.25)	
	3	Unknown 1	11.5 (0.01)	7.2 (0.44)	71.8 (4.07)	
	4	Unknown 2	14.3 (0.01)	4.6 (0.11)	56.7 (1.14)	694.4 (22.90)
PAR90TRS	1	Cyn-3-Gal	9.8 (0.04)	66.1 (0.89)	282.5 (13.03)	
	2	Cyn-3-Glu	10.8 (0.04)	19.6 (0.58)	108.7 (4.85)	
	3	Unknown 1	11.6 (0.04)	7.7 (0.28)	59.9 (2.62)	
	4	Unknown 2	14.3 (0.04)	6.6 (0.11)	55.7 (1.59)	506.8 (20.99)
Parkhill	1	Cyn-3-Gal	9.8 (0.04)	66.5 (0.38)	289.4 (16.80)	
	2	Cyn-3-Glu	10.9 (0.03)	19.6 (0.25)	113.1 (6.18)	
	3	Unknown 1	11.6 (0.03)	7.4 (0.12)	60.6 (2.50)	
	4	Unknown 2	14.3 (0.03)	6.5 (0.07)	56.6 (1.86)	528.7 (27.31)
Pasture	1	Cyn-3-Gal	10.0 (0.20)	63.0 (0.86)	235.7 (8.76)	
	2	Cyn-3-Glu	11.0 (0.17)	21.6 (0.51)	104.5 (4.76)	
	3	Unknown 1	11.7 (0.17)	8.5 (0.09)	58.3 (1.68)	
	4	Unknown 2	14.4 (0.16)	6.9 (0.33)	53.2 (2.16)	451.7 (16.79)

PearsonII	1	Cyn-3-Gal	9.8 (0.02)	61.1 (0.70)	216.2 (19.70)	
	2	Cyn-3-Glu	10.9 (0.01)	21.6 (0.54)	99.72 (7.93)	
	3	Unknown 1	11.6 (0.01)	10.1 (0.08)	61.3 (3.50)	
	4	Unknown 2	14.3 (0.00)	7.2 (0.13)	52.4 (2.18)	429.5 (33.07)
Pembina[4]	1	Cyn-3-Gal	9.7	64.3	290.0	
	2	Cyn-3-Glu	10.8	20.3	115.6	
	3	Unknown 1	11.5	8.9	66.6	
	4	Unknown 2	14.2	6.5	56.6	528.8
Quaker	1	Cyn-3-Gal	9.9 (0.01)	66.0 (1.89)	284.7 (19.62)	
	2	Cyn-3-Glu	10.9 (0.01)	19.2 (1.30)	107.2 (1.17)	
	3	Unknown 1	11.6 (0.01)	8.0 (0.24)	61.4 (0.82)	
	4	Unknown 2	14.3 (0.03)	6.8 (0.39)	56.4 (0.30)	509.6 (19.12)
Regent	1	Cyn-3-Gal	10.0 (0.18)	65.9 (1.93)	279.0 (14.02)	
	2	Cyn-3-Glu	11.0 (0.15)	19.5 (0.79)	108.3 (9.37)	
	3	Unknown 1	11.7 (0.15)	7.9 (0.84)	60.9 (6.02)	
	4	Unknown 2	14.4 (0.15)	6.7 (0.32)	56.2 (3.52)	504.5 (32.83)
Smoky	1	Cyn-3-Gal	10.0 (0.11)	59.9 (0.57)	251.6 (18.80)	
	2	Cyn-3-Glu	11.0 (0.10)	22.4 (0.30)	116.8 (8.65)	
	3	Unknown 1	11.7 (0.10)	10.3 (0.13)	68.8 (4.02)	
	4	Unknown 2	14.4 (0.11)	7.5 (0.16)	58.2 (3.10)	495.5 (34.52)
Success	1	Cyn-3-Gal	10.0 (0.17)	70.4 (0.75)	249.9 (17.03)	
	2	Cyn-3-Glu	11.0 (0.12)	16.9 (0.35)	87.0 (5.25)	
	3	Unknown 1	11.7 (0.15)	11.4 (0.24)	49.7 (1.94)	
	4	Unknown 2	14.4 (0.15)	11.7 (0.24)	51.2 (2.51)	437.8 (26.49)
Thiessen	1	Cyn-3-Gal	9.8 (0.07)	65.0 (0.09)	276.8 (71.16)	
	2	Cyn-3-Glu	10.9 (0.06)	20.3 (0.20)	110.9 (22.16)	
	3	Unknown 1	11.6 (0.05)	8.1 (0.28)	61.6 (9.63)	
	4	Unknown 2	14.3 (0.05)	6.7 (0.15)	55.5 (6.62)	504.7 (109.54)

[1] Amount of unknowns calculated as cyanidin-3-galactoside.
[2] Mean of three replicates.
[3] Standard error of the replicate mean.
[4] Only one replicate available.
Shaded values indicate the minimum or maximum value within a column for each peak.

Table 18. Statistical comparison of anthocyanin contents of saskatoon cultivars harvested from the Saskatoon site in 2000.

Cultivar	Peak 1 Cyanidin-3-Galactoside (μg/g)	Peak2 Cyanidin-3-Glucoside (μg/g)	Peak 3 Unidentified (μg/g)[1]	Peak 4 Unidentified (μg/g)[1]	Total Amount (μg/g)[1]
Bluff	490.5[2](10.24)[3]a[4]	174.7 (1.62) a	95.8 (0.82) a	76.8 (0.24) a	837.9 (10.27) a
Buffalo	344.8 (24.97) b	142.7 (13.4) b	75.3 (7.21) b	67.8 (4.95) b	630.5 (48.98) bc
Forestburg	203.4 (6.04) e	102.0 (1.36) cde	60.8 (0.34) cde	52.2 (0.35) c	418.4 (7.59) e
Honeywood	240.8 (6.13) cde	106.0 (6.35) cde	64.4 (3.22) bcd	54.7 (2.32) c	465.9 (17.82) de
Martin	298.0 (20.22) bc	110.5 (6.78) cde	62.0 (2.66) cd	55.2 (1.96) c	525.7 (31.54) cde
Nelson	540.0 (22.53) a	183.9 (6.69) a	94.6 (3.30) a	79.9 (1.92) a	898.5 (34.20) a
Northline	477.0 (16.00) a	89.0 (2.25) e	71.8 (4.07) bc	56.7 (1.14) c	694.4 (22.90) b
PAR90TRS	282.5 (13.03) bc	108.7 (4.85) cde	59.9 (2.62) de	55.7 (1.59) c	506.8 (20.99) de
Parkhill	289.4 (16.80) cb	113.1 (6.18) cd	60.6 (2.50) cde	56.6 (1.86) c	528.7 (27.31) cd
Pasture	235.7 (8.76) cde	104.5 (4.76) cde	58.3 (1.68) de	53.2 (2.16) c	451.7 (16.79) de
PearsonII	216.2 (19.70) de	99.72 (7.93) cde	61.3 (3.50) cde	52.4 (2.18) c	429.5 (33.07) de
Quaker	284.7 (19.62) bc	107.2 (1.17) cde	61.4 (0.82) cde	56.4 (0.30) c	509.6 (19.12) de
Regent	279.0 (14.02) bcd	108.3 (9.37) cde	60.9 (6.02) cde	56.2 (3.52) c	504.5 (32.83) de
Smoky	251.6 (18.80) cde	116.8 (8.65) c	68.8 (4.02) bcd	58.2 (3.10) c	495.5 (34.52) de
Success	249.9 (17.03) cde	87.0 (5.25) e	49.7 (1.94) e	51.2 (2.51) c	437.8 (26.49) de
Thiessen	276.8 (71.16) bcd	110.9 (22.16)	61.6 (9.63) cd	55.5 (6.62) c	504.7 (109.54) de
Pop. Mean	310.6	116.6	66.7	58.7	552.5
Std Error	23.65	8.34	4.06	7.96	108.69
LSD[5]	68.3	24.1	11.73	2.76	37.63

[1] Amount calculated as Cyanidin-3-Galactoside.
[2] Mean of three replicates.
[3] Standard error of the replicate mean.
[4] Values in with the same letter in a column are not significantly different ($p<0.05$).
[5] Least significant difference ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 19. Panelists' mean responses to each cultivar for tartness, sweetness, firmness, seediness, flavour intensity, and flavour acceptability.

Cultivar	Tartness	Sweetness	Firmness	Seediness	Flavour Intensity	Flavour Acceptability
Bluff	5.2 ef [1]	5.4 abcd	4.9 c	4.9 def	5.0 c	5.5 ab
Buffalo	4.8 cde	5.6 cde	3.2 a	4.5 abcde	4.8 bc	5.6 ab
Honeywood	5.7 f	4.9 ab	4.8 c	5.0 ef	5.3 cd	5.5 ab
Martin	4.4 bc	5.5 bcde	4.8 c	4.9 def	4.9 bc	5.4 ab
Nelson	3.6 a	6.1 e	4.0 b	4.3 abc	3.5 a	6.9 c
Northline	4.1 abc	5.7 cde	4.0 b	4.5 abcd	4.1 ab	6.3 bc
PAR90TRS	4.1 ab	5.4 abcd	4.8 c	5.1 f	4.7 bc	5.4 ab
Pasture	4.1 abc	5.6 cde	5.0 c	5.0 ef	4.8 bc	5.6 ab
Pembina	5.1 def	5.2 abc	4.8 c	4.8 cdef	4.8 bc	5.9 abc
Quaker	3.7 a	5.9 de	4.7 c	4.9 cdef	4.6 bc	5.5 ab
Regent	5.4 ef	4.8 a	4.0 b	4.3 ab	4.8 bc	5.7 ab
Smoky	5.7 f	5.5 bcde	4.8 c	4.8 bcdef	5.8 d	5.8 ab
Success	5.8 f	5.1 abc	4.7 c	4.2 a	4.9 bc	5.9 ab
Thiessen	4.4 bcd	5.3 abc	4.7 c	5.0 ef	5.0 c	5.2 a

[1] Values with the same letter within a column are not significantly different ($p \leq 0.05$)
Shaded values indicate the minimum or maximum value within a column.

Table 20. Fruit characteristics of choke cherry cultivars and selections harvested in 1997 from Alberta and two locations in Saskatchewan.

Location	Sample ID	Moisture (% H_2O)	Soluble Solids (°Brix)	pH	Total Titratable Acidity (% Citric Acid)	% Pit	Mean Wght per Fruit (g)
Alberta samples							
	Garrington	62.7	18.2	4.52	0.53	19.6	0.66
	Schubert	65.1	18.2	4.11	0.70	21.7	0.89
	Boughen Yellow	66.2	16.8	4.01	0.88	24.6	0.69
	BRS - 9301	65.2	18.5	4.13	0.82	23.6	0.66
	BRS - 9302	67.6	14.1	3.97	0.97	22.5	0.60
	BRS - 9303	64.8	15.5	4.28	0.88	22.5	0.41
	BRS - 9304	68.9	14.8	3.82	0.96	20.1	0.62
	BRS - 9306	69.9	14.8	4.19	0.76	18.9	0.71
	BRS - 9307	68.7	10.0	3.81	0.97	30.2	0.49
	BRS - 9309	68.9	17.2	4.13	0.70	19.4	0.52
	BRS - 9311	59	19.4	4.10	0.67	26.4	0.44
	BRS - 9314	65.1	15.9	4.16	0.85	22.9	0.56

Indian Head, SK sample						
E5461-SBC		17.4	3.97	0.93	20.9	0.89
Accession Orchards, Saskatoon, SK						
SX 88 (?) R15-33	65.7	16.8	4.27	0.87	21	0.54
SX 88 (?) R15-45	58.4	17.8	4.13	1.06	24.6	0.71
SX 88 19 R 9-36	65.3	16.2	4.04	1.12	18.2	0.65
SX 88 19 R10- 1	63.7	16.0	4.08	0.86	16.5	0.69
SX 88 19 R10- 3	66.8	16.2	4.13		17.3	0.85
SX 88 19 R10- 5	64.7	17.0	4.05	0.83	20.3	0.67
SX 88 19 R10-14	63.2	16.8	3.87		22.7	0.61
SX 88 19 R10-19	65.7	15.7	4.23	0.67	20.9	0.68
SX 88 19 R10-30	67.9	15.0	3.95	0.88	17.5	0.73
Accession Orchards, Saskatoon, SK						
SX 88 23 R 9- 4	65.8	16.0	4.07	0.90	16.9	0.72
SX 88 23 R 9-15	58.7	20.8	3.90	1.38	21.6	0.57
SX 88 23 R 9-16	62.2	20.1	4.26	0.82	19.9	0.59
SX 88 33 R13- 7	61.1	16.5	4.12	0.86	21.8	0.46
SX 88 34 R14-87	58.8	15.7	4.02	0.93	22.1	0.47
SX 88 45 R 2-19	66.6	18.2	4.1		16.6	0.74
SX 88 45 R 2-68	65.6		4.19	0.82	20.4	0.58
SX 88 48 R12-14	70.6	13.6	3.93	0.81	18.7	0.79
SX 88 48 R12-15	66.1	13.0	3.97	0.61	19.6	0.56
SX 88 48 R12-65	68		3.93	0.92	19.2	0.66
SX 88 51 R13-58	63		4.29	0.80	21	0.58
SX 88 56 R10-49	66.8		4.15	0.82	20.4	0.67
SX 88 58 R 6- 6	63.7	15.4	3.96	0.84	20.9	0.55
SX 88 58 R 6-20	66.8	16.8	3.95		16.2	0.77
SX 88 58 R 6-48	63.8	18.0	4.25	0.76	16.9	0.72
SX 88 58 R 7- 1	64.1		4.00	0.90	17.4	0.73
SX 88 58 R 7- 5	64.9		4.17	0.80	20.4	0.77
SX 88 58 R 7- 7	58.4		4.10	1.04	23.5	0.39
SX 88 66 R14- 4	61.6		4.18	0.78	22.3	0.51

Shaded values indicate the minimum or maximum value within a column.

Table 21. Fruit characteristics of choke cherry cultivars and selections harvested in 1998 from several locations in Saskatchewan.

Cultivar/ Selection	Location	Ten Fruit Weight (g)	% Total Solids	% Pit (w/w)	Estimated % Flesh (dry basis)	pH	Soluble Solids (°Brix)
Garrington	Outlook	7.1 (0.31)	35.5 (1.33)	12.1 (0.75)	23.4 (0.63)	4.2 (0.10)	18.2 (1.31)
	Saskatoon	7.6 (0.09)	36.6 (1.02)	12.8 (0.10)	23.8 (1.23)	4.3 (0.00)	17.2 (0.53)
		7.4 (0.17)	36.0 (0.82)	12.4 (0.38)	23.6 (0.63)	4.3 (0.06)	17.7 (0.67)
Lee	Outlook	7.9 (0.10)	32.2 (0.22)	10.7[5](0.08)	21.3[5](0.04)	4.1[5](0.06)	17.6[5](0.45)

Boughen Yellow	Outlook Saskatoon	6.4[1](0.10)[2] 6.4 (0.20) 6.4[3](0.11)[4]	37.1 (0.94) 35.8 (1.12) 36.5 (0.72)	13.8 (0.19) 14.4 (0.21) 14.1 (0.16)	23.3 (1.20) 21.5 (1.35) 22.4 (0.91)	4.0 (0.02) 4.0 (0.03) 4.0 (0.02)	19.3 (0.89) 18.8 (0.53) 19.1 (0.48)
3-11	Saskatoon	3.3	46.8	20.5	26.3	4.0	22.5
3-24	Saskatoon	6.6	37.5	12.3	25.2	3.9	17.1
3-25	Saskatoon	3.7	43.3	14.6	28.7	4.1	21.9
3-45	Saskatoon	6	44.2	15.7	28.5	4.0	21.6
4-33	Saskatoon	4.4	39.5	14.7	24.8	3.9	21.0
4-41	Saskatoon	4.5	39.7	11.9	27.8	4.2	21.6
8-2	Saskatoon	4.5	44.8	16.7	28.1	3.8	19.8
8-3	Saskatoon	6.7	37.7	14.5	23.1	4.0	17.1
8-5	Saskatoon	4.5	40.5	15.7	24.9	4.0	18.0
8-16	Saskatoon	5.6	38.7	14.0	24.8	3.9	18.3
8-30	Saskatoon	6.7	36.5	12.6	23.9	3.9	19.5
9-15	Saskatoon	4.3	43.8	16.6	27.2	3.7	20.1
9-78	Saskatoon	4.1	42.8	16.9	26.0	3.9	16.2
11-1	Saskatoon	6.4	38.6	11.7	26.9	4.0	20.4
13-4	Saskatoon	4.2	42.6	17.1	25.5	4.1	15.9
14-14	Saskatoon	4.9	44.8	20.2	24.5	4.0	25.5
15-4	Saskatoon	3.5	40.4	16.9	23.5	4.1	18.9
15-5	Saskatoon	4.5	41.1	16.5	24.7	4.1	18.9
15-40	Saskatoon	4.1	43.4	16.5	26.9	4.1	20.4
16-7	Saskatoon	3.7	37.4	15.0	22.4	4.1	19.5
16-8	Saskatoon	3.1	45.0	20.3	24.7	4.3	21.9
16-9	Saskatoon	3.7	35.5	15.2	20.3	4.1	18.6
16-36	Saskatoon	5.6	37.3	12.7	24.6	4.0	18.6
16-74	Saskatoon	4.7	34.0	12.4	21.6	4.0	18.0
16-87	Saskatoon	4.8	41.4	18.8	22.6	4.2	19.2
17-10	Saskatoon	5.4	39.9	15.7	24.3	4.1	20.1
17-14	Saskatoon	4	38.9	15.5	23.4	4.1	17.4
17-20	Saskatoon	4.8	36.0	13.5	22.5	4.0	19.8
17-21	Saskatoon	4.3	39.9	15.2	24.7	4.1	17.1
17-22	Saskatoon	6.1	39.0	13.1	25.9	4.4	20.7
17-69	Saskatoon	4.4	42.5	20.6	22.0	4.1	20.1
Population Mean (Population Std. Deviation)		5.5 (0.08)	38.8 (0.59)	14.6 (0.100)	24.4 (2.48)	4.1 (0.14)	19.1 (1.94)

[1] Unless otherwise noted, is the mean of three replicated plants within a site.
[2] Standard error of the replicate mean.
[3] Mean of all samples collected for a particular cultivar.
[4] Standard error of the cultivar mean.
[5] Fruit from only two replicated plants within a site available for analysis.
Shaded values indicate the minimum or maximum value within a column.

Table 22. Fruit characteristics of choke cherry cultivars harvested in 1999 from Outlook and Saskatoon.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	% Pit (w/w)	Estimated % Flesh (dry basis)	pH	Soluble Solids (°Brix)	L Value	Hue Angle[1]
Garrington	Outlook	6.6[2](0.48)[3]	35.0 (0.18)	14.4 (0.59)	20.6 (0.43)	4.1 (0.02)	15.5 (0.66)	29.4 (2.59)	39.5 (4.77)
	Saskatoon	8.4 (0.46)	35.2 (1.53)	12.2 (0.11)	23.0 (1.43)	4.3 (0.01)	15.7 (0.26)	24.5 (1.63)	38.7 (2.90)
		7.5[4](0.50)[5]	35.1 (0.69)	13.3 (0.57)	21.8 (0.86)	4.2 (0.06)	15.6 (0.32)	26.9(1.75)	39.1 (2.50)
Lee	Outlook	7.8 (0.07)	32.6 (0.18)	11.0 (0.24)	21.5 (0.26)	4.1 (0.02)	15.1 (0.66)	46.8 (0.39)	82.8 (0.56)
	Saskatoon	8.6 (0.10)	34.4 (1.11)	11.1 (0.23)	23.3 (1.12)	4.1 (0.02)	15.4 (0.53)	44.6 (0.62)	80.3 (0.97)
		8.2 (0.17)	33.5 (0.65)	11.1 (0.15)	22.4 (0.65)	4.1 (0.01)	15.3 (0.38)	45.7 (0.60)	81.5 (0.75)
Boughen Yellow	Outlook	6.5 (0.22)	31.4 (1.05)	14.7 (0.52)	16.7 (1.53)	3.8 (0.02)	13.0 (0.36)	51.9 (0.36)	91.7 (0.79)
	Saskatoon	7.3 (0.21)	30.9 (0.72)	15.0 (0.45)	15.9 (1.17)	4.1 (0.14)	12.1 (0.20)	47.2 (0.89)	87.2 (2.44)
		6.9 (0.22)	31.1 (0.58)	14.8 (0.32)	16.3 (0.88)	3.9 (0.09)	12.6 (0.27)	49.5 (1.14)	89.5 (1.52)
Copper Shubert	Saskatoon	8.1 (0.01)	37.2[6](0.27)	12.6[6](0.29)	24.9[6](0.32)	4.1[6](0.32)	15.8[6](0.05)	40.5[6](0.40)	73.1[6](0.85)
Goertz	Saskatoon	8.7 (0.01)	31.8 (0.34)	9.6 (0.12)	22.2 (0.24)	4.3 (0.07)	16.6 (0.36)	36.9 (1.22)	66.3 (1.96)
Mission Red	Saskatoon	6.7 (0.77)	36.7 (2.00)	13.8 (1.29)	22.9 (1.05)	4.1 (0.01)	17.6 (0.45)	37.6 (0.96)	65.3 (0.97)
Robert	Saskatoon	9.3 (0.11)	35.8 (1.95)	13.1 (0.27)	22.6 (1.75)	4.0 (0.03)	13.5 (0.52)	44.6 (1.39)	79.1 (3.06)
Population Mean (Population Std. Dev.)		7.8 (1.06)	34.0 (2.68)	12.8 (1.85)	21.2 (3.12)	4.1 (0.16)	14.9 (0.16)	40.5 (8.5)	70.5 (18.43)

[1] Hue angle=$\tan^{-1}$(b/a)
[2] Unless otherwise noted, refers to the mean of three replicated plants within a site.
[3] Standard error of the replicate mean.
[4] Mean of all replicates collected for a particular cultivar.
[5] Standard error of cultivar mean.
[6] Fruit of only two replicate plants within a site available for analysis.
Shaded values indicate the minimum or maximum value within a column.

Table 23. Statistical comparison of the fruit characteristics of choke cherry cultivars harvested from Outlook and Saskatoon in 1999.

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean % Pit (w/w)	Mean Estimated % Flesh (dry basis)	Mean pH	Mean Soluble Solids (°Brix)	Mean L Value	Mean Hue Angle[1]
Garrington	7.5[2] a[3]	35.1 a	13.3 a	21.8 a	4.2 a	15.6 a	27.0 b	39.1 c
Lee	8.1 a	33.5 ab	11.1 a	22.4 a	4.1 a	15.3 a	45.7 a	81.5 b
Boughen Yellow	6.9 a	31.2 b	14.8 a	16.3 b	3.9 a	12.6 b	49.5 a	89.5 a

[1] Hue angle=$\tan^{-1}$(b/a)
[2] Cultivar least square mean.
[3] Values with the same letter within a column are not significantly different ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 24. Fruit Characteristics of choke cherry cultivars harvested in 2000 from Outlook and Saskatoon.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	% Pit	Estimated % Flesh (dry basis)	pH	Soluble Solids (°Brix)	L Value	Hue Angle	Chroma
Boughen Yellow	Outlook	6.9 (0.28)	36.6 (0.40)	15.3 (0.08)	21.3 (0.33)	3.8 (0.00)	21.8 (0.78)	55.2 (0.72)	89.0 (0.18)	12.9 (0.45)
	Saskatoon	6.5 (0.18)	35.4 (0.97)	16.9 (0.54)	18.5 (0.57)	3.8 (0.01)	20.6 (0.40)	55.1 (0.84)	89.1 (0.11)	13.6 (0.62)
		6.7 (0.18)	36.0 (0.54)	16.1 (0.43)	19.9 (0.68)	3.8 (0.00)	21.2 (0.48)	55.1 (0.50)	89.1 (0.10)	13.3 (0.37)
Garrington	Outlook	7.4 (0.09)	37.9 (0.51)	13.8 (0.19)	24.2 (0.58)	4.1 (0.02)	21.3 (1.08)	32.2 (2.07)	36.3 (6.13)	24.9 (1.22)
	Saskatoon	7.0 (0.36)	37.2 (0.20)	15.0 (0.49)	22.2 (0.31)	4.2 (0.03)	21.9 (1.21)	22.1 (2.68)	30.6 (3.71)	26.2 (0.36)
		7.2 (0.19)	37.5 (0.30)	14.4 (0.36)	23.2 (0.54)	4.1 (0.02)	21.6 (0.74)	27.1 (2.73)	33.5 (3.45)	25.6 (0.64)
Lee	Outlook	7.8 (0.17)	30.9 (0.30)	12.0 (0.22)	18.9 (0.23)	3.8 (0.00)	19.3 (1.18)	51.3 (0.66)	78.1 (3.23)	15.2 (1.08)
	Saskatoon	7.9 (0.23)	32.9 (0.34)	12.2 (0.13)	20.7 (0.25)	4.0 (0.01)	22.2 (0.62)	48.8 (1.13)	79.3 (2.42)	18.1 (0.75)
		7.9 (0.13)	31.9 (0.51)	12.1 (0.12)	19.8 (0.44)	3.9 (0.03)	20.8 (0.88)	50.1 (0.81)	78.7 (1.82)	16.7 (0.87)
Goertz	Saskatoon	9.6 (0.50)	31.1 (0.22)	9.3 (0.20)	22.0 (0.31)	4.0 (0.02)	22.4 (0.70)	40.4 (2.07)	56.7 (3.72)	20.2 (0.86)
Mini Shubert	Saskatoon	6.8 (0.22)	42.0 (0.75)	14.6 (0.03)	27.4 (0.78)	4.1 (0.01)	26.4 (0.60)	52.1 (0.63)	85.2 (0.76)	16.9 (0.54)
Mission Red	Saskatoon	6.5 (0.60)	39.3 (0.92)	14.8 (1.05)	24.5 (0.13)	3.9 (0.02)	20.2 (0.85)	46.0 (1.03)	71.1 (2.79)	19.1 (1.06)
Robert	Saskatoon	7.9 (0.14)	39.4 (0.40)	15.8 (0.28)	23.6 (0.60)	4.1 (0.01)	21.1 (0.87)	44.8 (1.41)	67.9 (4.29)	20.2 (0.70)
Population Mean (Population Std. Dev.)		7.4 (0.96)	36.2 (3.44)	13.9 (2.11)	22.2 (2.57)	4.0 (0.13)	21.7 (2.08)	45.2 (9.93)	69.2 (3.48)	18.6 (4.14)

[1] Unless otherwise noted, refers to the mean of three replicated plants within a site.
[2] Standard error of the replicate mean.
[3] Mean of all replicates collected for a particular cultivar.
[4] Standard error of cultivar mean.
Shaded values indicate the minimum or maximum value within a column.

Table 25. Statistical comparison of fruit characteristics of choke cherry cultivars harvested from Outlook and Saskatoon in 2000.

Cultivar	Mean Ten Fruit Wght (g)	Mean % Total Solids	Mean % Pit	Mean Est. % Flesh (dry basis)	Mean pH	Mean Soluble Solids (°Brix)	Mean L Value	Mean Hue Angle[1] (°)	Mean Chroma
Boughen Yellow	6.7 b[2]	36.0 b	16.1 a	19.9 b	3.8 c	21.2 a	55.1 a	89.1 a	13.3 c
Garrington	7.2 b	37.6 a	14.4 b	23.2 a	4.2 a	21.6 a	27.2 c	33.5 c	25.6 a
Lee	7.9 a	31.9 c	12.1 c	19.8 b	3.9 b	20.8 a	50.1 b	78.8 b	16.7 b

[1] Hue angle=$\tan^{-1}$(b/a)
[2] Values with the same letter within a column are not significantly different ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 26. Fruit characteristics of black currant cultivars and selections harvested in 1997 from two locations in Saskatchewan.

	Sample ID	pH	Soluble solids (°Brix)	Moisture (%H_2O)	Ten Fruit Weight (g)
Yorkton[1]	5-23-23[2]	3.26 c[3]	16.5 ab	77.8 a	7.4 ab
	5-23-42	3.20 c (0.06)[4]	18.0 a (0.30)	77.4 a (1.20)	7.6 ab (0.79)
	5-24-29[2]	3.24 c	14.2 ab		
	5-24-9[2]	3.26 c	15.0 ab		
	25-23-23	3.12 bc (0.03)	15.8 ab (0.53)	80.6 b (0.20)	7.5 ab (0.64)
	Boskoop Giant	2.95 a (0.04)	13.8 b (0.30)	80.9 b (0.67)	6.2 a (0.51)
	Consort	3.05 abc (0.07)	15.6 ab (1.17)	78.1 a(0.14)	5.7 a (0.44)
	Wellington	2.97 ab (0.01)	15.2 ab (0.34)	80.0 ab(0.26)	10.0 b (1.28)
	Willoughby	3.08 abc (0.04)	15.0 ab (0.60)	78.2 a (0.55)	7.2 ab (0.34)
Outlook[1]	Consort	3.05 (0.01)	16.4 (0.55)	75.9 (0.68)	4.5 a (0.09)
	Wellington	3.00 (0.01)	17.9 (0.65)	75.0 (0.36)	8.1 b (0.21)
	Willoughby	3.08 (0.05)	15.9 (0.70)	77.0 (0.90)	6.2 ab (0.76)

[1] Statistical analysis was completed separately for each site.
[2] Single replicate for analysis, therefore no standard error analysis for this sample.
[3] Means with different letters are significantly different at the P=0.05 level. Means separation was completed using the Bonferroni separation.
[4] Numbers in brackets denote standard error for the sample.
Shaded values indicate the minimum or maximum value within a column.

Table 27. Fruit characteristics of black currant cultivars and selections harvested in 1998 from several locations in Saskatchewan.

Cultivar/ Selection	Location	Ten Fruit Weight (g)	% Total Solids	pH	Soluble Solids (°Brix)	Hue Angle [1]	Total Titratable Acidity (% citric acid)
Boskoop	Yorkton	8.5[2](0.58)[3]	18.9(0.38)	2.9 (0.01)	13.8 (0.13)	16.6[4](0.13)	4.70[4](0.091)
Consort	Indian Head	4.6 (0.23)	23.6 (0.05)	2.9 (0.01)	16.8 (0.02)	16.2[5]	4.88[5]
	Outlook	2.6 (0.15)	26.3 (0.45)	2.9 (0.00)	18.5 (0.73)	15.5 (0.41)	4.99 (0.083)
	Saskatoon	7.5[5]	23.2[5]	3.0[5]	16.0[5]	16.1[5]	4.51[5]
	Yorkton	7.8[4](0.31)	20.1(0.75)	2.9[4](0.02)	13.6 (0.55)	16.4[4]	4.71[4](0.183)
		6.2[6](0.48)[7]	23.7(0.93)	2.9 (0.02)	16.5 (0.77)	15.9 (0.24)	4.83 (0.087)
Topsy	Yorkton	5	24.3	3.2	17.3	NA[8]	NA
Wellington	Outlook	9.4 (0.42)	24.7 (0.05)	2.9 (0.03)	18.2 (0.12)	19.1 (0.24)	4.21 (0.113)
	Saskatoon	8.6[4](1.16)	21.2[4](0.27)	3.1[4](0.01)	15.5 (0.65)	16.6[5]	4.49[5]
	Yorkton	12.3 (0.23)	19.7 (0.20)	2.9 (0.02)	15.1[4](0.32)	16.5 (0.27)	4.48 (0.113)
		10.3 (0.77)	21.9 (0.75)	3.0 (0.03)	16.4 (0.56)	16.4 (0.15)	4.37 (0.080)
Willoughby	Indian Head	8.8[5]	23.2[5]	3.0[5]	17.5[5]	NA	NA
	Outlook	6.7 (0.28)	22.9 (0.64)	3.0 (0.02)	16.0 (0.54)	16.1 (0.19)	4.31 (0.052)
	Yorkton	8.9 (0.24)	21.2 (0.83)	3.0 (0.03)	14.3 (0.60)	16.4[5]	3.98 [5]
		7.9 (0.47)	22.2 (0.54)	3.0 (0.02)	15.5 (0.55)	16.2 (0.15)	4.22 (0.089)
5-23-42	Saskatoon	7.9 (0.25)	24.7 (0.28)	3.3 (0.02)	18.0 (0.41)	NA	NA
	Yorkton	12.0 (0.46)	19.7 (0.42)	3.0 (0.04)	14.2 (0.29)	15.9 (1.23)	3.61 (0.083)
		10.0 (0.95)	22.2 (1.14)	3.2 (0.06)	16.1 (0.88)		
5-24-9	Yorkton	9.6[5](0.37)	22.3 (0.79)	3.2[5](0.03)	14.9[5](0.05)	NA	NA
25-23-23	Yorkton	13.2 (0.52)	18.7 (0.57)	3.1 (0.03)	13.4 (0.60)	16.7 (0.16)	3.55 (0.146)
Population Mean (Population Std. Dev.)		8.8 (2.56)	22.0 (2.46)	3.0 (0.12)	15.7 (1.85)	16.2 (0.75)	4.31 (0.491)

[1] Hue angle=$\tan^{-1}$(b/a)
[2] Unless otherwise noted, is the mean of three replicated plants within a site.
[3] Standard error of the replicate mean.
[4] Fruit from only two replicated plants within a site available for analysis.
[5] Fruit from only one plant within a site available for analysis.
[6] Mean of all samples collected for a particular cultivar.
[7] Standard error of cultivar mean.
[8] NA= Not available due to insufficient amount of sample.
Shaded values indicate the minimum or maximum value within a column.

Table 28. Fruit characteristics of black currant selections and cultivars harvested in 1999 from Outlook, Saskatoon, and Yorkton.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	pH	Soluble Solids (°Brix)	L Value of Juice Extract[1]	Hue Angle[2] of Juice Extract[1]	Total Titratable Acidity (g/100 g as citric acid)	L Value of Diluted Supernatant[3]	Hue Angle[2] of Diluted Supernatant[3]
25-23-23	Saskatoon	14.0[4](1.17)[5]	19.8 (0.59)	3.1 (0.01)	14.0 (0.41)	9.4 (1.54)	11.8 (1.52)	3.37 (0.03)	15.9 (0.21)	16.5 (0.19)
	Yorkton	11.0 (0.32)	20.5 (0.99)	3.1 (0.04)	14.0 (0.32)	9.4 (0.77)	12.4 (0.31)	3.20 (0.34)	15.6 (0.49)	16.6 (0.39)
		12.5[6](0.87)[7]	20.1 (0.54)	3.1 (0.02)	14.0 (0.23)	9.4 (0.77)	12.1 (0.71)	3.29 (0.16)	15.8 (0.25)	16.5 (0.19)
5-23-42	Saskatoon	15.3[8](0.62)	24.8[8](0.70)	2.9[8](0.02)	14.7[8](0.20)	12.3[8](2.04)	15.0[8](0.68)	3.05[8](0.28)	14.4[8](2.25)	15.5[8](1.29)
	Yorkton	11.3 (1.44)	22.2 (0.17)	3.0 (0.02)	15.5 (0.30)	8.9 (0.91)	12.4 (0.67)	2.90 (0.10)	14.6 (0.68)	16.2 (0.42)
		12.9 (1.28)	23.2 (0.68)	3.0 (0.02)	15.2 (0.26)	10.3 (1.16)	13.4 (0.78)	2.96 (0.11)	14.5 (0.80)	16.0 (0.50)
5-24-9	Saskatoon	14.9 (0.55)	21.2 (0.83)	3.1 (0.00)	13.3 (0.17)	13.5 (0.31)	15.8 (0.48)	3.14 (0.03)	15.8 (0.32)	16.9 (0.23)
	Yorkton	9.9 (1.04)	23.0 (1.63)	3.2 (0.02)	14.9 (1.03)	9.3 (0.98)	11.1 (1.74)	2.97 (0.12)	15.7 (0.78)	16.3 (0.25)
		12.4 (1.23)	22.1 (0.91)	3.2 (0.02)	14.1 (0.59)	11.4 (1.06)	13.4 (1.33)	3.06 (0.07)	15.7 (0.38)	16.6 (0.20)
Boskoop Giant	Saskatoon	8.6[9]	23.2[9]	3.0[9]	14.5[9]	15.5[9]	17.6[9]	3.09[9]	13.6[9]	15.3[9]
	Yorkton	8.4 (0.29)	21.6 (1.34)	3.0[8](0.06)	14.5[8](0.35)	8.5[8](0.21)	9.8[8](3.89)	3.90[9]	13.9[9]	16.3[9]
		7.9 (0.32)	22.3 (1.00)	3.0 (0.04)	14.5 (0.20)	10.8 (2.34)	12.4 (3.45)	3.49 (0.41)	13.7 (0.12)	15.8 (0.50)
Consort	Outlook	6.7 (0.44)	26.1 (1.39)	2.9 (0.04)	16.9 (0.30)	8.3 (0.22)	10.1 (1.27)	4.02 (0.07)	12.5 (0.18)	14.8 (0.34)
	Saskatoon	10.6 (2.65)	22.5 (0.67)	2.9 (0.03)	15.0 (0.69)	9.6 (1.75)	11.6 (1.35)	3.92 (0.12)	14.9 (0.84)	16.4 (0.47)
	Yorkton	6.9 (0.71)	24.0 (0.21)	2.9 (0.01)	15.3 (0.43)	8.8 (0.40)	10.1 (2.04)	3.99 (0.11)	13.3 (0.61)	15.5 (0.12)
		8.1 (1.02)	24.2 (0.69)	2.9 (0.10)	15.7 (0.39)	8.9 (0.56)	10.6 (0.84)	3.98 (0.05)	13.6 (0.48)	15.6 (0.29)
Coronet	Saskatoon	7.8 (0.47)	22.4 (0.46)	2.9 (0.02)	14.9 (0.07)	9.7 (0.40)	10.2 (0.52)	4.09 (0.16)	14.3 (0.78)	15.6 (0.15)

Crusader	Saskatoon	8.2 (0.19)	22.3 (0.74)	2.9 (0.02)	14.7 (0.67)	9.8 (0.64)	10.8 (1.24)	4.21 (0.02)	13.7 (0.70)	16.0 (0.21)
Magnus	Saskatoon	9.1 (0.22)	23.3 (1.33)	3.0 (0.03)	14.6 (0.06)	11.6 (0.67)	12.4 (0.80)	4.10 (0.15)	13.9 (0.51)	16.1 (0.18)
	Yorkton	6.9 (0.60)	25.3 (0.40)	3.0 (0.05)	16.0 (0.67)	10.3 (0.82)	11.2 (2.44)	3.49[9]	12.8[9]	14.9[9]
		8.0 (0.56)	24.3 (0.77)	3.0 (0.03)	15.3 (0.43)	11.0 (0.55)	11.8 (1.18)	3.95 (0.19)	13.7 (0.46)	15.8 (0.33)
Topsy	Saskatoon	9.6 (0.19)	23.3 (1.14)	3.0 (0.03)	14.9 (0.41)	11.2 (0.66)	12.5 (1.17)	3.98 (0.04)	13.8 (0.27)	15.7 (0.15)
	Yorkton	7.5[9]	23.9[9]	3.0[9]	15.7[9]	12.8[9]	12.9[9]	3.54[9]	14.8[9]	16.3[9]
		9.1 (0.55)	23.4 (0.83)	3.0 (0.02)	15.1 (0.35)	11.6 (0.61)	12.6 (0.83)	3.87 (0.12)	14.0 (0.32)	15.8 (0.18)
Wellington	Outlook	11.8 (0.28)	23.1 (0.28)	2.8 (0.02)	16.8 (0.65)	8.9 (1.38)	10.7 (1.22)	3.66 (0.14)	12.7 (0.53)	15.7 (0.33)
	Saskatoon	11.8 (2.00)	22.4 (0.71)	2.8 (0.01)	14.7 (0.25)	13.3 (2.17)	14.2 (1.88)	4.13[8](0.23)	15.5[8](0.42)	15.9[8](0.82)
	Yorkton	12.3 (0.74)	22.8 (1.45)	2.9 (0.07)	15.1 (0.52)	11.6 (2.18)	11.7 (2.23)	3.67 (0.26)	14.3 (0.26)	16.1 (0.09)
		12.0 (0.62)	22.8 (0.49)	2.8 (0.02)	15.5 (0.40)	11.3 (1.16)	12.2 (1.05)	3.78 (0.13)	14.0 (0.47)	15.9 (0.21)
Willoughby	Outlook	8.7 (0.16)	25.3 (0.65)	2.9 (0.01)	17.0 (0.44)	9.7 (1.14)	10.9 (2.49)	3.39 (0.10)	13.4 (0.32)	15.2 (0.39)
	Saskatoon	9.8 (0.34)	22.7 (0.61)	3.0 (0.02)	14.5 (0.09)	15.5 (0.55)	16.5 (0.54)	3.95 (0.05)	16.4 (0.46)	17.0 (0.06)
	Yorkton	9.5 (0.14)	24.3 (0.44)	3.0 (0.02)	15.3 (0.18)	12.9 (0.84)	14.3 (1.07)	3.55 (0.15)	13.4 (0.54)	15.6 (0.27)
		9.3 (0.21)	24.1 (0.47)	3.0 (0.01)	15.6 (0.39)	12.7 (0.95)	13.9 (1.14)	3.63 (0.10)	14.4 (0.55)	15.9 (0.31)
Population Mean		10.0	23.0	3.0	15.1	10.7	12.3	3.64	14.4	16.0
(Population Std. Dev.)		(2.73)	(1.96)	(0.10)	(1.13)	(2.54)	(2.87)	(0.46)	(1.39)	(0.73)

[1] Juice extract used for pH and soluble solids analyses.
[2] Hue angle=$\tan^{-1}$(b/a)
[3] Diluted supernatant used for titratable acidity analysis.
[4] Unless otherwise noted, refers to the mean of three replicate plants within a site.
[5] Standard error of the replicate mean.
[5] Mean of all replicates collected for a particular cultivar.
[7] Standard error of cultivar mean.
[8] Fruit of only two replicate plants within a site available for analysis.
[9] Fruit of only one plant within a site available for analysis.
Shaded values indicate the minimum or maximum cultivar mean within a column.

Table 29. Statistical comparison of the fruit characteristics of black currant selections and cultivars harvested from Saskatoon and Yorkton utilizing least square means 1999.

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean pH	Mean Soluble Solids (°Brix)	Mean L Value of Juice Extract[1]	Mean Hue Angle[2] of Juice Extract[1]	Mean Total Titratable Acidity (g/100 g as citric acid)	Mean L Value of Diluted Supernatant[3]	Mean Hue Angle[2] of Diluted Supernatant
25-23-23	12.5[4] a[5]	20.1 a	3.1 b	14.0 a	9.4 a	12.1 a	3.29 b	15.8 a	16.6 a
5-23-42	13.1 a	23.7 a	3.0 bc	15.1 a	10.4 a	13.4 a	2.98 b	14.4 a	15.8 a
5-24-9	12.4 a	22.1 a	3.2 a	14.1 a	11.4 a	13.4 a	3.06 b	15.7 a	16.6 a
Boskoop Giant	8.0 b	22.7 a	3.0 bc	14.5 a	12.6 a	14.1 a	3.48 ab	13.8 a	15.7 a
Consort	8.8 b	23.2 a	2.9 c	15.2 a	9.2 a	10.9 a	3.96 a	14.1 a	16.0 a
Magnus	8.0 b	24.3 a	3.0 b	15.3 a	11.0 a	11.8 a	3.84 a	13.1 a	15.5 a
Topsy	8.5 b	23.4 a	3.0 bc	15.1 a	11.7 a	12.1 a	3.81 a	14.0 a	16.0 a
Wellington	12.0 a	22.6 a	2.9 c	14.9 a	12.5 a	13.0 a	3.90 a	14.9 a	16.0 a
Willoughby	9.7 b	23.5 a	3.0 b	14.9 a	14.2 a	15.4 a	3.75 a	14.9 a	16.3 a

[1] Juice extract used for pH and soluble solids analyses.
[2] Hue angle=$\tan^{-1}(b/a)$
[3] Diluted supernatant used for titratable acidity analysis.
[4] Least square mean.
[5] Values with the same letter within a column are not significantly different ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 30. Fruit Characteristics of black currant cultivars and selections harvested in 2000 from Outlook, Saskatoon, and Yorkton.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	pH	Soluble Solids (°Brix)	L Value	Hue Angle	Chroma	Titratable Acidity (% citric acid)
25-23-23	Saskatoon	10.6[1](0.73)[2]	20.3 (0.29)	3.0 (0.05)	16.0 (0.67)	8.3 (0.66)	13.1 (0.54)	11.3 (1.81)	3.2 (0.03)
	Yorkton	11.7 (1.16)	21.1 (0.80)	3.0 (0.02)	16.6 (0.55)	6.7 (0.32)	14.6 (0.57)	6.8 (1.17)	3.2 (0.02)
		11.2[3](0.66)[4]	20.7 (0.42)	3.0 (0.03)	16.3 (0.41)	7.5 (0.48)	13.9 (0.49)	9.1 (1.39)	3.2 (0.02)
5-23-42	Saskatoon	12.8 (0.70)	21.8 (0.37)	3.0 (0.03)	16.8 (0.07)	10.1 (0.62)	13.5 (0.33)	16.4 (1.72)	3.1 (0.03)
	Yorkton	12.1 (0.39)	21.9 (0.19)	3.0 (0.01)	16.9 (0.07)	8.4 (0.59)	13.3 (0.84)	13.7 (1.70)	3.2 (0.05)
		12.5 (0.40)	21.8 (0.19)	3.0 (0.02)	16.9 (0.06)	9.2 (0.54)	13.4 (0.41)	15.0 (1.24)	3.1 (0.03)
5-24-9	Saskatoon	10.1 (0.64)	22.6 (0.53)	3.2 (0.01)	16.6 (0.09)	8.4 (0.94)	13.3 (0.76)	12.3 (2.24)	3.1 (0.02)
	Yorkton	9.0 (1.00)	23.2 (0.94)	3.2 (0.03)	17.4 (1.03)	6.8 (0.59)	15.1 (0.75)	8.3 (2.56)	3.0 (0.05)
		9.6 (0.59)	22.9 (0.50)	3.2 (0.02)	17.0 (0.49)	7.6 (0.61)	14.2 (0.63)	10.3 (1.75)	3.1 (0.03)
Boskoop Giant	Saskatoon	8.3 (0.15)	19.6 (0.88)	3.0 (0.03)	15.7 (0.25)	9.9 (2.68)	14.7 (0.80)	13.2 (4.01)	4.0 (0.09)
	Yorkton	7.1 (1.27)	20.3 (0.51)	2.9 (0.02)	16.4 (0.19)	6.6 (0.24)	14.9 (0.73)	8.0 (1.31)	3.9 (0.04)
		7.7 (0.63)	20.0 (0.48)	2.9 (0.03)	16.0 (0.20)	8.2 (1.41)	14.8 (0.49)	10.6 (2.23)	3.9 (0.04)
Consort	Outlook	4.5 (0.53)	24.8 (0.51)	2.9 (0.01)	18.8 (0.05)	5.5 (0.04)	15.8 (2.39)	3.5 (0.11)	3.6 (0.29)
	Saskatoon	8.7 (2.52)	22.3 (0.60)	3.0 (0.02)	16.8 (0.07)	9.4 (1.37)	13.8 (0.54)	14.4 (3.46)	4.2 (0.07)
	Yorkton	6.9 (0.20)	22.9 (0.20)	2.9 (0.04)	17.9 (0.70)	6.6 (0.62)	12.7 (1.50)	7.3 (1.91)	4.0 (0.03)
		6.7 (0.96)	23.3 (0.43)	2.9 (0.02)	17.7 (037)	7.4 (0.78)	13.9 (0.83)	9.0 (2.12)	4.0 (0.11)
Coronet	Saskatoon	6.9 (0.31)	22.5 (0.38)	2.9 (0.01)	17.0 (0.30)	7.3 (0.39)	14.4 (0.68)	9.7 (1.04)	4.3 (0.03)
Crusader	Saskatoon	7.7 (0.22)	22.5 (0.33)	2.9 (0.03)	16.9 (0.22)	6.9 (0.47)	13.1 (1.10)	8.8 (1.40)	4.3 (0.02)
Magnus	Saskatoon	6.7 (0.65)	21.8 (0.04)	3.0 (0.03)	16.4 (0.15)	11.4 (1.03)	13.3 (0.18)	15.8 (0.49)	3.8 (0.10)
	Yorkton	7.3 (0.22)	23.7 (0.13)	3.0 (0.04)	18.1 (0.93)	6.2 (0.48)	11.1 (0.97)	5.9 (1.38)	3.2 (0.09)
		7.0 (0.33)	22.8 (0.43)	3.0 (0.02)	17.3 (0.57)	8.8 (1.28)	12.2 (0.65)	10.8 (2.31)	3.5 (0.13)
Topsy	Saskatoon	6.7 (0.22)	21.8 (0.14)	3.0 (0.01)	17.0 (0.15)	8.6 (1.03)	12.9 (0.72)	11.6 (2.41)	3.9 (0.08)
	Yorkton	6.7 (0.21)	24.6 (0.78)	2.9 (0.00)	18.8 (0.50)	7.0 (0.96)	14.5 (1.29)	6.2 (0.92)	3.6 (0.15)
		6.7 (0.13)	23.2 (0.71)	2.9 (0.00)	17.7 (0.48)	7.9 (0.74)	13.6 (0.68)	9.5 (1.90)	3.8 (0.10)

Wellington	Outlook	9.1 (0.96)	24.0 (0.44)	2.9 (0.01)	19.7 (0.07)	6.9 (0.85)	14.6 (0.69)	9.0 (2.32)	3.3 (0.27)
	Saskatoon	10.0 (1.59)	21.0 (0.55)	2.9 (0.04)	16.6 (0.44)	9.5 (2.07)	12.1 (1.97)	14.9 (5.33)	4.0 (0.18)
	Yorkton	11.4 (0.32)	19.6 (0.78)	2.8 (0.02)	15.7 (0.83)	11.0 (2.24)	15.4 (0.10)	19.3 (5.31)	3.8 (0.10)
		10.1 (0.64)	21.5 (0.72)	2.9 (0.03)	17.4 (0.67)	9.1 (1.10)	14.0 (0.78)	14.4 (2.72)	3.7 (0.14)
Willoughby	Outlook	6.6 (0.39)	23.3 (0.49)	3.1 (0.02)	18.4 (0.15)	5.3 (2.66)	13.4 (0.54)	9.2 (0.01)	3.2 (0.11)
	Saskatoon	8.7 (0.55)	21.4 (0.26)	3.0 (0.02)	16.7 (0.24)	8.7 (0.81)	14.1 (0.32)	11.3 (1.29)	3.7 (0.05)
	Yorkton	9.0 (0.91)	22.2 (0.24)	2.9 (0.05)	17.5 (0.71)	8.7 (2.24)	12.1 (2.11)	11.3 (5.00)	3.5 (0.11)
		8.1 (0.50)	22.3 (0.33)	3.0 (0.03)	17.4 (0.35)	7.6 (1.17)	13.2 (0.77)	10.8 (1.73)	3.5 (0.08)
Population Mean		8.6	22.1	3.0	17.1	13.7	11.0	8.2	3.6
(Population Std. Dev.)		(2.42)	(1.58)	(0.10)	(1.19)	(1.78)	(5.28)	(2.27)	(0.44)

[1] Unless otherwise noted, refers to the mean of three replicated plants within a site.
[2] Standard error of the replicate mean.
[3] Mean of all replicates collected for a particular cultivar.
[4] Standard error of cultivar mean.
Shaded values indicate the minimum or maximum value within a column.

Table 31. Statistical comparison of fruit characteristics of black currant selections and cultivars harvested from Saskatoon and Yorkton in 2000.

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean pH	Mean Soluble Solids (°Brix)	Mean Hue Angle[1]	Mean Chroma	Mean L Value	Mean Total Titratable Acidity (% citric acid)
25-23-23	11.2 c[2]	20.7 ab	3.0 c	16.3 ab	13.7 a	9.1 a	7.5 a	3.23 ab
5-23-42	12.5 dc	21.8 bc	3.0 c	16.9 abc	13.4 a	15.0 ab	9.2 a	3.13 a
5-24-9	9.6 c	22.9 c	3.2 d	17.0 abc	14.2 a	10.3 a	7.6 a	3.03 a
Boskoop Giant	7.7 ab	20.3 a	2.9 b	16.0 a	14.8 a	10.6 ab	8.2 a	3.94 d
Consort	7.8 abc	22.6 c	2.9 b	17.4 bc	13.2 a	10.9 ab	8.0 a	4.10 d
Magnus	7.0 a	22.8 c	3.0 c	17.3 bc	12.2 a	10.9 ab	8.8 a	3.49 bc

Topsy	6.7 a	23.2 c	3.0 bc	17.8 c	13.8 a	9.0 a	7.8 a	3.78 cd
Wellington	10.7 c	20.3 ab	2.8 a	16.2 ab	13.8 a	17.1 b	10.3 a	3.93 d
Willoughby	8.8 bc	21.8 abc	3.0 bc	17.1 abc	13.1 a	11.3 ab	8.7 a	3.60 c

[1] Hue angle=$\tan^{-1}$(b/a)
[2] Values with the same letter within a column are not significantly different ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 32. Characteristics of black currant juices subjected to sensory analysis and panelists' responses regarding the comparison of juices to a commercial product.

Samples	%titratable acidity (as citric acid)	Soluble solids (as °Brix)	Sig. Different than Ribena	Correct Responses	Pref.
Ribena (commercial product)	1.2	69			
Wellington (1st assessment)	1.2	50	NSD	35655	4R/4W
Boskoop Giant (1st assessment)	1.1	48	Sig diff 0.1%	35777	8R/2B
5-23-42 (1st assessment)	0.5	50	Sig diff 0.1%	35714	6R/2 5-
Wellington (2nd assessment)	1	60	Sig. diff 1.0%	35684	5R/4W
Boskoop Giant (2nd assessment)	1.3	58	NSD	35593	3R/3B
5-23-42 (2nd assessment)	0.9	60	Sig. diff 1.0%	35685	5R/3 5-

Table 33. Fruit characteristics of pin cherry cultivars harvested in 1997 from Saskatoon and Indian Head.

Location	Cultivar	Weight per Fruit (g)	Moisture (%H_2O)	Soluble solids (°Brix)	pH
Saskatoon	Jumping Pound	0.51 a[1] (0.01)[2]	73.8 a (0.49)	16.5 a (0.72)	3.34 a (0.02)
	Lee #4	0.47 b (0.003)	77.1 b (0.22)	13.2 b (1.22)	3.49 b (0.03)
	Mary Liss	0.51 a (0.02)	74.2 a (0.31)	18.5 a (0.53)	3.33 a (0.02)
Indian Head[3]	Jumping Pound	0.51 (0.02)	75.3 a (0.21)	17.3 a (0.16)	3.27 a (0.01)
	Lee #4	NA[4]	76.7 b (0.31)	9.6 b (2.55)	3.37 b (0.02)
	Mary Liss	0.47 (0.35)	73.2 a (0.35)	17.5 a (1.08)	3.29 a (0.02)

[1] Means with different letters are significantly different at the P=0.05 level. Means separation was completed using the Bonferroni separation.
[2] Numbers in brackets denote standard error for the sample.
[3] No means separation completed at Indian Head for the characteristics fruit weight and % pit due to missing data.
[4] NA=Not available.
Shaded values indicate the minimum or maximum value within a column.

Table 34. Fruit characteristics of pin cherry cultivars harvested in 1998 from Saskatoon.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	% Pit (w/w)	Estimated % Flesh (dry basis)	pH	Soluble Solids (°Brix)
Jumping Pound	Saskatoon	5.9[1](0.18)[2]	26.1 (0.58)	5.9 (0.11)	20.2 (0.82)	3.3 (0.01)	20.4 (0.60)
Mary Liss	Saskatoon	5.8 (0.19)	25.6 (0.51)	6.1 (0.17)	19.5 (0.56)	3.3 (0.00)	19.6 (0.53)
Population Mean		5.9	25.8	6.0	19.9	3.3	20.0
(Population Std.Deviation)		(0.54)	(1.24)	(0.42)	(1.05)	(0.02)	(1.33)

[1] Mean of three replicated plants within a site.
[2] Standard error of the replicate mean

Table 35. Fruit characteristics of pin cherry cultivars harvested in 1999 from Outlook and Saskatoon.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	% Pit (w/w)	Estimated % Flesh (dry basis)	pH	Soluble Solids (°Brix)	L Value	Hue Angle[1]
Jumping Pound	Outlook	7.0[2](0.22)[3]	22.4 (1.28)	6.1 (0.02)	16.3 (1.30)	3.2 (0.02)	15.4 (0.84)	15.5 (0.22)	18.1 (0.25)
Lee #4	Outlook	7.3 (0.16)	21.3 (0.14)	7.4 (0.15)	13.9 (0.13)	3.2 (0.01)	13.1 (0.28)	21.1 (0.34)	22.6 (0.02)
	Saskatoon	8.3 (0.38)	20.8 (0.34)	6.9 (0.09)	14.0 (0.32)	3.2 (0.02)	12.4 (0.41)	21.7 (0.69)	23.3 (0.38)
		7.8[4](0.29)[5]	21.1 (0.20)	7.1 (0.15)	13.9 (0.16)	3.2 (0.01)	12.8 (0.28)	21.4 (0.37)	22.9 (0.22)
Mary Liss	Outlook	7.3 (0.25)	21.8 (0.47)	6.3 (0.22)	15.5 (0.33)	3.1 (0.02)	14.1 (0.15)	15.7 (0.26)	18.1 (0.08)
Population Mean (Population Std. Dev.)		7.5 (0.62)	21.6 (1.16)	6.7 (0.55)	14.9 (1.42)	3.2 (0.03)	13.7 (1.32)	18.5 (2.99)	20.5 (2.45)

[1] Hue angle=$\tan^{-1}$(b/a)
[2] Unless otherwise noted, refers to the mean of three replicated plants within a site.
[3] Standard error of the replicate mean.
[4] Mean of all replicates collected for a particular cultivar.
[5] Standard error of cultivar mean.
Shaded values indicate the minimum or maximum cultivar mean within a column.

Table 36. Statistical comparison of the fruit characteristics of pin cherry cultivars harvested from Outlook and Saskatoon in 1999.

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean % Pit (w/w)	Mean Estimated % Flesh (dry basis)	Mean pH	Mean Soluble Solids (°Brix)	Mean L Value	Mean Hue Angle[1]
Jumping Pound	7.0 a[2]	22.4 a	6.1 b	16.3 a	3.1 a	15.4 a	15.5 b	18.1 b
Lee #4	7.3 a	21.3 a	7.4 a	13.9 a	3.2 a	13.1 a	21.1 a	22.6 a
Mary Liss	7.3 a	21.8 a	6.3 b	15.5 a	3.1 a	14.1 a	15.7 b	18.1 b

[1] Hue angle=$\tan^{-1}$(b/a)
[2] Values with the same letter within a column are not significantly different ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 37. Fruit Characteristics of pin cherry cultivars harvested in 2000 from Outlook and Saskatoon.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	% Pit	Estimated % Flesh (dry basis)	pH	Soluble Solids (°Brix)	L Value	Hue Angle	Chroma
Jumping Pound	Outlook	6.4 (0.25)	15.7 (0.09)	6.1 (0.02)	9.5 (0.10)	3.1 (0.02)	18.2 (1.28)	15.8 (0.52)	17.4 (0.35)	32.4 (0.36)
	Saskatoon	7.5 (0.11)	14.1 (0.43)	6.4 (0.93)	7.8 (1.35)	3.1 (0.01)	16.6 (0.41)	16.4 (0.72)	17.8 (0.22)	32.7 (1.57)
		6.9 (0.25)	14.9 (0.39)	6.3 (0.42)	8.6 (0.72)	3.1 (0.01)	17.4 (0.69)	16.1 (0.42)	17.6 (0.21)	32.5 (0.72)
Lee #4	Outlook	6.3 (0.27)	16.6 (0.27)	7.5 (1.15)	9.1 (0.97)	3.1 (0.02)	18.6 (0.35)	17.8 (0.46)	19.3 (0.09)	33.0 (1.15)
	Saskatoon	7.7 (0.29)	13.2 (0.20)	7.2 (0.24)	6.0 (0.13)	3.1 (0.02)	14.5 (0.32)	20.7 (0.61)	21.1 (0.34)	36.0 (0.70)
		7.0 (0.36)	14.9 (0.77)	7.4 (0.53)	7.5 (0.82)	3.1 (0.02)	16.6 (0.95)	19.2 (0.72)	20.2 (0.43)	34.5 (0.90)
Mary Liss	Saskatoon	7.5 (0.25)	13.7 (0.29)	5.6 (0.13)	8.2 (0.22)	3.1 (0.02)	16.6 (1.06)	16.0 (0.90)	17.7 (0.27)	31.8 (1.86)
Population Mean (Population Std. Dev.)		7.1 (0.18)	14.7 (0.35)	6.6 (0.32)	8.1 (0.44)	3.1 (0.01)	16.9 (0.49)	17.3 (0.54)	18.7 (0.38)	33.2 (0.61)

[1] Unless otherwise noted, refers to the mean of three replicated plants within a site.
[2] Standard error of the replicate mean.
[3] Mean of all replicates collected for a particular cultivar.
[4] Standard error of cultivar mean.
Shaded values indicate the minimum or maximum cultivar mean within a column.

Table 38. Statistical comparison of fruit characteristics of pin cherry cultivars harvested from Saskatoon in 2000.

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean Pit	Mean % Flesh	Mean pH	Mean Soluble Solids (°Brix)	Mean L Value	Mean Hue Angle[1]	Mean Chroma
Jumping Pound	7.5[2] a[3]	14.1 a	6.4 a	7.8 a	3.1 a	16.6 a	16.4 b	17.8 b	32.7 a
Lee #4	7.7 a	13.2 a	7.2 a	6.0 a	3.1 a	14.5 a	20.6 a	21.1 a	36.0 a
Mary Liss	7.5 a	13.7 a	5.5 a	8.2 a	3.1 a	16.6 a	16.0 b	17.7 b	31.8 a

[1] Hue angle=$\tan^{-1}(b/a)$ [2] Least square mean. [3] Values with the same letter within a column are not significantly different ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 39. Fruit Characteristics of highbush cranberry cultivars harvested in 1999 from Indian Head, Outlook, and Saskatoon.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	% Pit	Estimated % Flesh (dry basis)	pH	Soluble Solids (°Brix)	L Value	Hue Angle	Chroma
Alaska	Indian Head	6.9[1](0.32)[2]	19.0 (0.21)	5.3 (0.32)	13.7 (2.40)	3.0 (0.01)	9.5 (0.05)	18.7 (0.31)	17.2 (0.05)	39.6 (0.27)
	Outlook	5.7 (0.56)	21.9 (1.55)	5.9 (0.12)	17.1 (1.89)	3.1 (0.01)	12.5 (0.15)	16.4 (0.19)	16.3 (0.11)	35.6 (0.01)
	Saskatoon	6.9 (0.03)	18.2 (0.17)	5.8 (0.09)	12.4 (0.23)	3.0 (0.00)	10.4 (0.09)	17.1 (0.16)	16.5 (0.07)	37.0 (0.34)
		6.5[3](0.26)[4]	19.7 (0.93)	5.6 (0.14)	14.1 (1.11)	3.0 (0.01)	10.7 (0.45)	17.3 (0.38)	16.7 (0.16)	37.4 (0.64)
Andrews	Saskatoon	4.1 (0.13)	18.6 (0.97)	6.3 (0.16)	12.3 (1.04)	3.1 (0.02)	9.0 (0.19)	20.7 (0.29)	18.0 (0.12)	40.5 (0.42)
Garry Pink	Saskatoon	6.5 (0.13)	21.4 (3.12)	7.0 (0.10)	14.4 (3.09)	3.0 (0.01)	9.5 (0.03)	19.4 (0.20)	17.6 (0.11)	39.7 (0.48)
Manito	Saskatoon	7.8 (0.26)	18.1 (0.38)	4.0 (0.18)	14.1 (0.44)	2.9 (0.01)	12.0 (0.46)	23.1 (1.12)	18.5 (0.18)	43.0 (0.90)
Phillips	Indian Head	3.5 (0.26)	16.9 (0.39)	5.1 (0.51)	11.8 (0.33)	3.2 (0.01)	9.7 (0.65)	20.2 (0.17)	18.0 (0.08)	39.8 (0.07)
	Outlook	3.7 (0.10)	20.6 (1.20)	5.7 (0.16)	15.7 (1.29)	3.3 (0.02)	12.4 (0.25)	18.2 (0.22)	17.3 (0.06)	36.5 (0.52)
	Saskatoon	3.8 (0.52)	19.4 (0.79)	6.0 (0.22)	13.3 (0.58)	3.2 (0.01)	11.5 (0.57)	20.0 (0.46)	17.7 (0.14)	39.6 (0.33)
		3.7 (0.17)	19.0 (0.69)	5.6 (0.24)	13.4 (0.66)	3.2 (0.02)	11.0 (0.50)	19.6 (0.36)	17.7 (0.11)	38.9 (0.54)
Wentworth	Indian Head	6.5 (0.12)	17.9 (1.29)	5.2 (0.26)	12.7 (1.46)	3.0 (0.01)	9.8 (0.09)	21.7 (0.16)	19.4 (1.05)	42.7 (0.37)
	Outlook	6.0 (0.32)	20.1 (0.34)	5.6 (0.09)	14.5 (0.39)	3.1 (0.04)	11.9 (0.35)	18.5 (0.17)	17.3 (0.23)	38.5 (0.37)
	Saskatoon	5.6 (0.16)	20.0 (1.18)	6.3 (0.12)	13.7 (1.06)	3.1 (0.02)	10.6 (0.23)	19.9 (0.94)	17.5 (0.37)	40.9 (1.18)
		6.0 (0.17)	19.3 (0.63)	5.7 (0.18)	13.6 (0.59)	3.0 (0.02)	10.8 (0.33)	20.0 (0.54)	18.1 (0.46)	40.7 (0.71)
Population Mean (Population Std. Dev.)		5.6 (0.24)	19.3 (0.41)	5.7 (0.14)	13.7 (0.42)	3.1 (0.02)	10.6 (0.22)	19.7 (0.34)	17.7 (0.16)	39.6 (0.39)

[1] Unless otherwise noted, refers to the mean of three replicated plants within a site.
[2] Standard error of the replicate mean.
[3] Mean of all replicates collected for a particular cultivar.
[4] Standard error of cultivar mean.
Shaded values indicate the minimum or maximum cultivar mean within a column.

Table 40. Statistical comparison of fruit characteristics of highbush cranberry cultivars harvested from Indian Head, Outlook, and Saskatoon in 1999.

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean % Pit	Mean % Flesh	Mean pH	Mean Soluble Solids (°Brix)	Mean Hue Angle (°)	Mean Chroma
Alaska	6.5 a[1]	19.7 a	5.7 a	14.4 a	3.1a	10.9 a	16.6 a	37.3 a
Phillips	3.7 b	19.0 a	5.6 a	13.8 a	3.2 a	11.1 a	17.7 b	38.6 b
Wentworth	6.0 b	19.3 a	5.7 a	13.6 a	3.1 b	10.8 a	18.1 b	40.7 c

[1] Values with the same letter within a column are not significantly different ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 41. Fruit Characteristics of highbush cranberry cultivars harvested in 2000 from Outlook and Saskatoon.

Cultivar	Location	Ten Fruit Weight (g)	% Total Solids	% Pit	Estimated % Flesh (dry basis)	pH	Soluble Solids (°Brix)	L Value	Hue Angle	Chroma
Alaska	Outlook	5.9[1](0.29)[2]	20.5 (0.98)	7.1 (0.36)	13.4 (0.78)	3.0 (0.02)	14.6 (0.66)	13.0 (0.71)	15.3 (0.28)	27.2 (1.33)
	Saskatoon	6.6 (0.28)	19.1 (0.40)	7.7 (0.03)	11.4 (0.42)	3.0 (0.01)	13.4 (0.23)	13.8 (0.45)	15.5 (0.21)	27.8 (0.81)
		6.3[3](0.24)[4]	19.8 (0.57)	7.4 (0.21)	12.4 (0.59)	3.0 (0.01)	14.0 (0.42)	13.4 (0.41)	15.4 (0.16)	27.5 (0.71)
Andrews	Saskatoon	4.2 (0.12)	17.6 (0.16)	7.2 (0.28)	10.4 (0.14)	3.1 (0.00)	11.5 (0.15)	16.8 (0.45)	17.0 (0.20)	34.6 (0.83)
Espenant	Saskatoon	5.7 (0.18)	18.4 (0.43)	6.5 (0.24)	11.9 (0.20)	2.9 (0.01)	13.7 (0.35)	18.0 (0.46)	17.2 (0.15)	34.9 (0.18)
Garry Pink	Saskatoon	6.1 (0.23)	19.4 (0.46)	8.9 (0.64)	10.5 (0.31)	3.0 (0.01)	12.3 (0.20)	15.9 (0.33)	16.6 (0.07)	33.2 (0.15)
Manito	Saskatoon	6.9 (0.19)	18.9 (0.13)	5.1 (0.19)	13.8 (0.32)	2.8 (0.02)	14.7 (0.33)	19.5 (0.26)	17.9 (0.04)	37.2 (0.64)
Wentworth	Outlook	5.8 (0.10)	20.1 (0.25)	6.9 (0.30)	13.2 (0.51)	3.0 (0.02)	15.1 (0.06)	13.2 (0.31)	14.9 (0.17)	25.9 (0.41)
	Saskatoon	5.8 (0.21)	20.6 (0.41)	7.9 (0.28)	12.8 (0.51)	3.0 (0.01)	14.2 (0.32)	14.1 (0.21)	15.9 (0.20)	30.1 (0.69)
		5.8 (0.10)	20.4 (0.24)	7.4 (0.28)	13.0 (0.34)	3.0 (0.01)	14.6 (0.25)	13.7 (0.26)	15.4 (0.24)	28.0 (1.01)
Population Mean (Population Std. Dev.)		5.9 (0.80)	19.3 (1.19)	7.2 (1.14)	12.2 (1.38)	3.0 (0.08)	13.7 (1.26)	15.5 (2.33)	16.3 (1.01)	31.4 (4.05)

[1] Unless otherwise noted, refers to the mean of three replicated plants within a site.
[2] Standard error of the replicate mean.
[3] Mean of all replicates collected for a particular cultivar.
[4] Standard error of cultivar mean.
Shaded values indicate the minimum or maximum value within a column.

Table 42 . Statistical comparison of fruit characteristics of highbush cranberry cultivars harvested from and Saskatoon in 2000.

Cultivar	Mean Ten Fruit Weight (g)	Mean % Total Solids	Mean % Pit	Mean % Flesh	Mean pH	Mean Soluble Solids (°Brix)	Mean L Value	Mean Hue Angle (°)	Mean Chroma
Alaska	6.6 a[1]	19.2 bc	7.8 b	11.4 cd	3.0 b	13.4 c	13.8 e	15.5 d	27.8 d
Andrews	4.2 c	17.6 d	7.2 bc	10.4 d	3.1 a	11.5 e	16.9 c	17.1 b	34.6 b
Espenant	5.7 b	18.4 cd	6.5 c	11.9 bc	2.9 c	13.7 bc	18.0 b	17.2 b	34.9 b
Garry Pink	6.1 b	19.4 b	8.9 a	10.5 d	3.0 b	12.3 d	15.9 d	16.6 c	33.3 b
Manito	6.9 a	18.9 bc	5.1 d	13.8 a	2.9 c	14.7 a	19.5 a	17.9 a	37.3 a
Wentworth	5.8 b	20.6 a	7.9 ab	12.7 b	3.0 b	14.2 b	14.1 e	15.9 d	30.1 c

[1] Values with the same letter within a column are not significantly different ($p<0.05$).
Shaded values indicate the minimum or maximum value within a column.

Table 43. Summary of fruit characteristics of saskatoon fruit for each year harvested and for each site harvested with means for all data collected.

Cultivar	Year Site	Ten Fruit Weight (g)		% TotalSolids		pH		SolubleSolids (°Brix)		L.Value		HueAngle		Total Titratable Acidity (% Malic Acid)		Total Anthocyanin Content (μg/g)	
Bluff	97	-[1]	-	-	-	4.1[2]	(0.03)[3]	14.1	(0.67)	-	-	-	-	-	-	-	-
	98	7.1	(0.48)	20.8	(0.74)	4.0	(0.03)	13.6	(0.67)	-	-	-	-	-	-	-	-
	99	8.6	(0.45)	21.0	(0.75)	4.0	(0.04)	14.2	(0.51)	14.4	(0.89)	17.3	(0.91)	0.49	(0.03)	716.8	(34.11)

	00	8.1	(0.44)	20.8	(0.56)	4.0	(0.04)	15.8	(0.40)	15.2	(0.87)	17.7	(0.47)	0.43	(0.03)	837.9	(38.88)
	ML[4]	8.1	(0.43)	20.7	(0.56)	4.0	(0.02)	14.3	(0.52)	14.6	(0.82)	17.3	(0.52)	-	-	-	-
	SK[5]	7.9	(0.47)	21.1	(0.69)	4.0	(0.03)	14.6	(0.64)	15.0	(1.10)	17.7	(1.05)	-	-	-	-
	Mn[6]	8.0	(0.32)	20.9	(0.45)	4.0	(0.02)	14.4	(0.41)	14.8	(0.69)	17.5	(0.57)	0.46	(0.02)	777.3	(28.80)
Buffalo	97	-	-	-	-	4.1	(0.03)	15.5	(0.67)	-	-	-	-	-	-	-	-
	98	9.3	(0.48)	23.1	(0.74)	4.0	(0.03)	16.1	(0.67)	-	-	-	-	-	-	-	-
	99	9.4	(0.45)	21.6	(0.75)	4.0	(0.04)	15.8	(0.51)	13.9	(0.89)	16.6	(0.91)	0.40	(0.03)	648.4	(34.11)
	00	9.9	(0.44)	23.2	(0.56)	4.0	(0.04)	18.3	(0.40)	16.0	(0.87)	17.0	(0.47)	0.44	(0.03)	630.5	(38.88)
	ML	9.6	(0.43)	22.4	(0.56)	4.0	(0.02)	16.0	(0.52)	13.5	(0.82)	16.4	(0.52)	-	-	-	-
	SK	9.5	(0.47)	22.8	(0.69)	4.1	(0.03)	16.4	(0.64)	16.4	(1.10)	17.2	(1.05)	-	-	-	-
	Mn	9.5	(0.32)	22.6	(0.45)	4.0	(0.02)	16.2	(0.41)	14.9	(0.69)	16.8	(0.57)	0.42	(0.02)	639.5	(28.80)
Forestburg	97	-	-	-	-	4.2	(0.03)	14.2	(0.67)	-	-	-	-	-	-	-	-
	98	12.1	(0.48)	21.0	(0.74)	4.2	(0.03)	15.4	(0.67)	-	-	-	-	-	-	-	-
	99	10.9	(0.45)	19.3	(0.75)	4.1	(0.04)	13.2	(0.51)	19.6	(0.89)	21.1	(0.91)	0.30	(0.03)	409.8	(34.11)
	00	11.3	(0.44)	21.5	(0.56)	4.2	(0.04)	17.4	(0.40)	19.2	(0.87)	19.1	(0.47)	0.38	(0.03)	418.4	(38.88)
	ML	11.9	(0.43)	19.9	(0.56)	4.2	(0.02)	15.0	(0.52)	19.9	(0.82)	20.1	(0.52)	-	-	-	-
	SK	11.0	(0.47)	21.3	(0.69)	4.2	(0.03)	15.1	(0.64)	18.9	(1.10)	20.1	(1.05)	-	-	-	-
	Mn	11.4	(0.32)	20.6	(0.45)	4.2	(0.02)	15.0	(0.41)	19.4	(0.69)	20.1	(0.57)	0.34	(0.02)	414.1	(28.80)
Honeywood	97	-	-	-	-	4.1	(0.03)	13.6	(0.67)	-	-	-	-	-	-	-	-
	98	11.2	(0.48)	22.7	(0.74)	4.1	(0.03)	16.4	(0.67)	-	-	-	-	-	-	-	-
	99	10.2	(0.45)	19.9	(0.75)	4.1	(0.04)	13.0	(0.51)	19.6	(0.89)	22.3	(0.91)	0.29	(0.03)	404.8	(34.11)
	00	10.6	(0.44)	22.4	(0.56)	4.2	(0.04)	18.1	(0.40)	17.4	(0.87)	18.0	(0.47)	0.33	(0.03)	465.9	(38.88)
	ML	11.0	(0.43)	20.7	(0.56)	4.1	(0.02)	15.1	(0.52)	18.9	(0.82)	19.4	(0.52)	-	-	-	-

	SK	10.4	(0.47)	22.7	(0.69)	4.2	(0.03)	15.4	(0.64)	18.1	(1.10)	20.9	(1.05)	-	-	-	-
	Mn	10.7	(0.32)	21.7	(0.45)	4.1	(0.02)	15.3	(0.41)	18.5	(0.69)	20.2	(0.57)	0.31	(0.02)	435.4	(28.80)
Martin	97	-	-	-	-	3.7	(0.03)	14.4	(0.67)	-	-	-	-	-	-	-	-
	98	16.4	(0.48)	19.8	(0.74)	3.7	(0.03)	14.3	(0.67)	-	-	-	-	-	-	-	-
	99	16.6	(0.45)	21.8	(0.75)	3.7	(0.04)	15.9	(0.51)	20.4	(0.89)	17.2	(0.91)	0.51	(0.03)	582.4	(34.11)
	00	16.9	(0.44)	20.7	(0.56)	3.7	(0.04)	15.6	(0.40)	23.2	(0.87)	18.8	(0.47)	0.52	(0.03)	525.7	(38.88)
	ML	16.7	(0.43)	20.6	(0.56)	3.7	(0.02)	15.3	(0.52)	22.2	(0.82)	17.9	(0.52)	-	-	-	-
	SK	16.5	(0.47)	21.0	(0.69)	3.8	(0.03)	15.0	(0.64)	22.4	(1.10)	18.2	(1.05)	-	-	-	-
	Mn	16.6	(0.32)	20.8	(0.45)	3.7	(0.02)	15.0	(0.41)	21.8	(0.69)	18.0	(0.57)	0.52	(0.02)	554.0	(28.80)
Nelson	97	-	-	-	-	3.7	(0.04)	16.1	(0.67)	-	-	-	-	-	-	-	-
	98	9.9	(0.48)	26.9	(0.81)	3.6	(0.03)	19.8	(0.72)	-	-	-	-	-	-	-	-
	99	12.0	(0.45)	21.8	(0.75)	3.7	(0.04)	17.2	(0.51)	16.6	(0.89)	17.0	(0.91)	0.57	(0.03)	805.0	(34.11)
	00	9.0	(0.44)	24.2	(0.56)	3.7	(0.04)	19.8	(0.40)	16.3	(0.87)	17.6	(0.47)	0.64	(0.03)	898.5	(38.88)
	ML	10.7	(0.43)	24.2	(0.56)	3.6	(0.02)	17.0	(0.52)	17.1	(0.82)	17.4	(0.52)	-	-	-	-
	SK	9.9	(0.50)	25.7	(0.73)	3.7	(0.03)	19.2	(0.71)	15.8	(1.10)	17.2	(1.05)	-	-	-	-
	Mn	10.3	(0.32)	24.9	(0.46)	3.7	(0.02)	18.0	(0.43)	16.4	(0.69)	17.3	(0.57)	0.61	(0.02)	851.8	(28.80)
Northline	97	-	-	-	-	3.8	(0.03)	14.5	(0.67)	-	-	-	-	-	-	-	-
	98	9.5	(0.48)	22.6	(0.74)	3.7	(0.03)	13.8	(0.67)	-	-	-	-	-	-	-	-
	99	10.8	(0.45)	24.5	(0.75)	3.8	(0.04)	16.1	(0.51)	16.0	(0.89)	17.3	(0.91)	0.50	(0.03)	704.5	(34.11)
	00	11.5	(0.44)	23.8	(0.56)	3.8	(0.04)	18.2	(0.40)	19.2	(0.87)	18.5	(0.47)	0.52	(0.03)	694.4	(38.88)
	ML	10.7	(0.43)	24.3	(0.56)	3.7	(0.02)	16.4	(0.52)	16.8	(0.82)	17.7	(0.52)	-	-	-	-
	SK	10.6	(0.47)	22.9	(0.69)	3.8	(0.03)	14.9	(0.64)	18.4	(1.10)	18.0	(1.05)	-	-	-	-
	Mn	10.6	(0.32)	23.6	(0.45)	3.8	(0.02)	15.7	(0.41)	17.6	(0.69)	17.9	(0.57)	0.51	(0.02)	699.5	(28.80)

PAR90TRS	97	-	-	-	-	3.7	(0.03)	14.8	(0.67)	-	-	-	-	-	-	-	-
	98	15.8	(0.48)	21.4	(0.74)	3.7	(0.03)	15.1	(0.67)	-	-	-	-	-	-	-	-
	99	16.2	(0.45)	21.4	(0.75)	3.7	(0.04)	14.8	(0.51)	19.3	(0.89)	17.3	(0.91)	0.54	(0.03)	642.1	(34.11)
	00	15.8	(0.44)	19.9	(0.56)	3.7	(0.04)	15.4	(0.40)	21.6	(0.87)	18.9	(0.47)	0.52	(0.03)	506.8	(38.88)
	ML	16.5	(0.43)	20.3	(0.56)	3.8	(0.02)	14.8	(0.52)	19.8	(0.82)	18.0	(0.52)	-	-	-	-
	SK	15.4	(0.47)	21.5	(0.69)	3.7	(0.03)	15.3	(0.64)	21.1	(1.10)	18.3	(1.05)	-	-	-	-
	Mn	15.9	(0.32)	20.9	(0.45)	3.7	(0.02)	15.0	(0.41)	20.5	(0.69)	18.1	(0.57)	0.53	(0.02)	574.5	(28.80)
Parkhill	97	-	-	-	-	4.1	(0.03)	14.4	(0.67)	-	-	-	-	-	-	-	-
	98	7.9	(0.48)	23.1	(0.74)	4.2	(0.03)	16.6	(0.67)	-	-	-	-	-	-	-	-
	99	11.5	(0.45)	21.9	(0.75)	4.1	(0.04)	16.4	(0.51)	15.1	(0.89)	17.4	(0.91)	0.31	(0.03)	529.5	(34.11)
	00	9.7	(0.44)	22.8	(0.56)	4.2	(0.04)	18.5	(0.40)	15.7	(0.87)	17.4	(0.47)	0.33	(0.03)	528.7	(38.88)
	ML	10.5	(0.43)	22.9	(0.56)	4.2	(0.02)	16.3	(0.54)	16.1	(0.82)	17.7	(0.52)	-	-	-	-
	SK	8.9	(0.47)	22.3	(0.69)	4.2	(0.03)	16.8	(0.64)	14.6	(1.10)	17.1	(1.05)	-	-	-	-
	Mn	9.7	(0.32)	22.6	(0.45)	4.2	(0.02)	16.6	(0.41)	15.4	(0.69)	17.4	(0.57)	0.32	(0.02)	529.1	(28.80)
Pearsonll	97	-	-	-	-	4.0	(0.03)	12.6	(0.67)	-	-	-	-	-	-	-	-
	98	12.4	(0.48)	21.8	(0.74)	4.2	(0.03)	15.8	(0.67)	-	-	-	-	-	-	-	-
	99	10.3	(0.45)	19.3	(0.75)	4.2	(0.04)	13.3	(0.51)	20.3	(0.89)	21.7	(0.91)	0.29	(0.03)	408.8	(34.11)
	00	10.5	(0.44)	23.1	(0.56)	4.2	(0.04)	18.4	(0.40)	16.6	(0.87)	18.0	(0.47)	0.31	(0.03)	429.5	(38.88)
	ML	11.5	(0.43)	21.2	(0.56)	4.1	(0.02)	15.5	(0.52)	18.2	(0.82)	18.7	(0.52)	-	-	-	-
	SK	10.6	(0.47)	21.6	(0.69)	4.2	(0.03)	16.1	(0.64)	18.7	(1.10)	21.0	(1.05)	-	-	-	-
	Mn	11.1	(0.32)	21.4	(0.45)	4.1	(0.02)	15.0	(0.41)	18.5	(0.69)	19.9	(0.57)	0.30	(0.02)	424.2	(28.80)
Pembina	97	-	-	-	-	3.9	(0.04)	19.6	(0.67)	-	-	-	-	-	-	-	-
	98	8.3	(0.48)	30.7	(0.74)	4.0	(0.03)	22.8	(0.72)	-	-	-	-	-	-	-	-

	99	9.9	(0.45)	24.9	(0.75)	3.9	(0.04)	16.0	(0.51)	19.6	(1.24)	19.2	(0.91)	0.62	(0.03)	356.6	(34.11)
	00	7.9	(0.44)	28.1	(0.61)	4.0	(0.04)	21.4	(0.49)	14.3	(0.90)	17.6	(0.47)	0.49	(0.03)	505.6	(38.88)
	ML	8.7	(0.43)	27.7	(0.56)	3.9	(0.02)	19.3	(0.54)	18.7	(1.35)	18.9	(0.57)	-	-	-	-
	SK	8.5	(0.50)	28.1	(0.73)	4.0	(0.03)	20.0	(0.71)	16.8	(1.10)	18.4	(1.29)	-	-	-	-
	Mn	8.6	(0.34)	27.9	(0.46)	3.9	(0.02)	19.7	(0.44)	17.8	(0.80)	18.7	(0.66)	0.62	(0.03)	395.8	(35.37)
Quaker	97	-	-	-	-	3.7	(0.04)	13.6	(0.67)	-	-	-	-	-	-	-	-
	98	14.8	(0.48)	19.7	(0.74)	3.7	(0.03)	13.8	(0.66)	-	-	-	-	-	-	-	-
	99	13.0	(0.45)	20.5	(0.75)	3.8	(0.04)	14.0	(0.51)	20.3	(0.89)	17.9	(0.91)	0.50	(0.03)	650.4	(34.11)
	00	12.7	(0.44)	19.4	(0.56)	3.8	(0.04)	14.3	(0.40)	22.5	(0.87)	19.2	(0.47)	0.49	(0.03)	509.6	(38.88)
	ML	13.8	(0.43)	19.6	(0.56)	3.7	(0.02)	14.2	(0.52)	20.4	(0.82)	18.4	(0.52)	-	-	-	-
	SK	13.2	(0.47)	20.1	(0.69)	3.8	(0.03)	13.7	(0.64)	22.2	(1.10)	18.6	(1.05)	-	-	-	-
	Mn	13.5	(0.32)	19.9	(0.45)	3.8	(0.02)	13.9	(0.41)	21.4	(0.69)	18.5	(0.57)	0.50	(0.02)	580.0	(28.80)
Regent	97	-	-	-	-	4.2	(0.03)	13.8	(0.67)	-	-	-	-	-	-	-	-
	98	7.6	(0.48)	22.6	(0.74)	4.2	(0.03)	16.2	(0.67)	-	-	-	-	-	-	-	-
	99	11.4	(0.45)	21.4	(0.75)	4.0	(0.04)	16.0	(0.51)	15.1	(0.89)	16.8	(0.91)	0.30	(0.03)	560.0	(34.11)
	00	8.7	(0.44)	22.5	(0.56)	4.2	(0.04)	18.5	(0.40)	16.2	(0.87)	17.8	(0.47)	0.30	(0.03)	504.5	(38.88)
	ML	9.6	(0.43)	22.7	(0.56)	4.1	(0.02)	16.5	(0.52)	16.5	(0.82)	17.6	(0.52)	-	-	-	-
	SK	8.9	(0.47)	21.6	(0.69)	4.2	(0.03)	15.7	(0.64)	14.8	(1.10)	17.0	(1.05)	-	-	-	-
	Mn	9.2	(0.32)	22.2	(0.45)	4.1	(0.02)	16.1	(0.41)	15.7	(0.69)	17.3	(0.57)	0.30	(0.02)	532.2	(28.80)
Smoky	97	-	-	-	-	4.1	(0.03)	13.1	(0.67)	-	-	-	-	-	-	-	-
	98	11.4	(0.48)	21.3	(0.74)	4.2	(0.03)	16.2	(0.67)	-	-	-	-	-	-	-	-
	99	10.7	(0.45)	19.7	(0.75)	4.1	(0.04)	13.6	(0.51)	19.2	(0.89)	21.0	(0.91)	0.28	(0.03)	408.4	(34.11)
	00	10.6	(0.44)	23.4	(0.56)	4.2	(0.04)	18.3	(0.40)	17.2	(0.87)	18.4	(0.47)	0.34	(0.03)	495.5	(38.88)

	ML	11.8	(0.43)	20.5	(0.56)	4.2	(0.02)	15.1	(0.52)	18.1	(0.82)	18.9	(0.52)	-	-	-	-
	SK	9.9	(0.47)	22.4	(0.69)	4.2	(0.03)	15.5	(0.64)	18.3	(1.10)	20.5	(1.05)	-	-	-	-
	Mn	10.9	(0.32)	21.5	(0.45)	4.2	(0.02)	15.3	(0.41)	18.2	(0.69)	19.7	(0.57)	0.31	(0.02)	451.9	(28.80)
Success	97	-	-	-	-	4.0	(0.03)	13.2	(0.67)	-	-	-	-	-	-	-	-
	98	7.1	(0.48)	21.8	(0.74)	4.1	(0.03)	14.7	(0.67)	-	-	-	-	-	-	-	-
	99	9.6	(0.45)	21.7	(0.75)	4.0	(0.04)	14.7	(0.51)	17.2	(0.89)	22.0	(0.91)	0.28	(0.03)	476.6	(34.11)
	00	7.1	(0.44)	22.3	(0.56)	4.0	(0.04)	16.5	(0.40)	14.0	(0.87)	19.6	(0.47)	0.30	(0.03)	437.8	(38.88)
	ML	8.0	(0.43)	22.0	(0.56)	4.1	(0.02)	14.5	(0.52)	15.6	(0.82)	20.1	(0.52)	-	-	-	-
	SK	7.8	(0.47)	21.9	(0.69)	4.1	(0.03)	15.4	(0.64)	15.6	(1.10)	21.6	(1.05)	-	-	-	-
	Mn	7.9	(0.32)	21.9	(0.45)	4.1	(0.02)	14.8	(0.41)	15.6	(0.69)	20.8	(0.57)	0.29	(0.02)	457.2	(28.80)
Thiessen	97	-	-	-	-	3.8	(0.03)	14.0	(0.67)	-	-	-	-	-	-	-	-
	98	16.6	(0.48)	20.6	(0.74)	3.8	(0.03)	14.6	(0.67)	-	-	-	-	-	-	-	-
	99	16.7	(0.45)	20.5	(0.75)	3.7	(0.04)	14.3	(0.51)	21.8	(0.89)	17.4	(0.91)	0.53	(0.03)	526.4	(34.11)
	00	15.5	(0.44)	20.2	(0.56)	3.8	(0.04)	15.4	(0.40)	21.8	(0.87)	18.9	(0.47)	0.44	(0.03)	504.7	(38.88)
	ML	16.6	(0.43)	20.0	(0.56)	3.7	(0.02)	14.2	(0.52)	21.3	(0.82)	18.2	(0.52)	-	-	-	-
	SK	15.9	(0.47)	20.8	(0.69)	3.8	(0.03)	14.9	(0.64)	22.3	(1.10)	18.1	(1.05)	-	-	-	-
	Mn	16.2	(0.32)	20.4	(0.45)	3.8	(0.02)	14.6	(0.41)	21.8	(0.69)	18.1	(0.57)	0.49	(0.02)	515.6	(28.80)

[1] Data unavailable.
[2] Least square mean.
[3] Standard error of least square mean.
[4] ML=Moon Lake, SK.
[5] SK=Saskatoon, SK.
[6] Cultivar mean for all available data.
Shaded values indicate the minimum or maximum value within a column.

Table 44. Summary of fruit characteristics of choke cherry fruit for each year harvested and for each site harvested with means for all data collected.

Cultivar	Year Site	Ten Fruit Weight (g)		% TotalSolids		pH		SolubleSolids (°Brix)		% Pit (w/w)		LValue		HueAngle	
Garrington	98	-[1]	-	-	-	4.3[2]	(0.04)[3]	17.7	(0.61)	12.4	(0.49)	-	-	-	-
	99	7.5	(0.34)	35.1	(0.67)	4.2	(0.07)	15.6	(0.35)	13.3	(0.40)	27.0	(1.24)	39.1	(1.62)
	0	7.2	(0.16)	37.6	(0.47)	4.2	(0.02)	21.6	(0.68)	14.4	(0.35)	27.2	(1.65)	33.4	(1.93)
	OL[4]	7.1	(0.18)	36.1	(0.77)	4.1	(0.04)	14.2	(2.24)	13.4	(0.41)	30.8	(1.17)	37.9	(2.06)
	SK[5]	7.7	(0.22)	36.3	(0.79)	4.3	(0.05)	14.1	(2.16)	13.3	(0.42)	23.3	(1.49)	34.6	(1.79)
	Mn[6]	7.4	(0.14)	36.2	(0.56)	4.2	(0.03)	14.1	(1.50)	13.4	(0.29)	27.1	(1.15)	36.3	(1.31)
Lee#4	98	-	-	-	-	4.0	(0.08)	17.4	(1.09)	10.6	(0.89)	-	-	-	-
	99	8.2	(0.34)	33.5	(0.67)	4.1	(0.07)	15.3	(0.35)	11.1	(0.40)	45.7	(1.24)	81.5	(1.62)
	0	7.9	(0.16)	31.9	(0.46)	3.7	(0.02)	20.8	(0.68)	12.1	(0.35)	50.1	(1.65)	78.8	(1.93)
	OL	7.9	(0.18)	31.9	(0.77)	4.0	(0.04)	14.4	(2.38)	11.4	(0.43)	49.1	(1.17)	80.4	(2.06)
	SK	8.2	(0.27)	33.7	(0.97)	4.1	(0.06)	18.8	(2.64)	11.7	(0.51)	46.7	(1.49)	79.8	(1.79)
	Mn	8.0	(0.16)	32.6	(0.61)	4.0	(0.04)	16.3	(1.70)	11.5	(0.32)	47.9	(1.15)	80.1	(1.31)
Boughen Yellow	98	-	-	-	-	4.0	(0.04)	19.1	(0.61)	14.1	(0.49)	-	-	-	-
	99	6.9	(0.34)	31.2	(0.67)	3.9	(0.07)	12.6	(0.35)	14.8	(0.40)	49.5	(1.24)	89.5	(1.62)
	0	6.7	(0.16)	36.0	(0.46)	3.8	(0.02)	21.2	(0.68)	16.1	(0.35)	55.1	(1.65)	89.1	(1.93)
	OL	6.6	(0.18)	35.0	(0.77)	3.9	(0.04)	13.7	(2.24)	14.6	(0.41)	53.6	(1.17)	90.4	(2.06)
	SK	6.7	(0.22)	34.1	(0.79)	4.0	(0.05)	13.0	(2.16)	15.4	(0.42)	51.1	(1.49)	88.2	(1.79)
	Mn	6.7	(0.14)	34.5	(0.56)	3.9	(0.03)	13.4	(1.50)	15.0	(0.29)	52.3	(1.15)	89.3	(1.31)

[1] Data unavailable.
[2] Least square mean.
[3] Standard error of least square mean.
[4] OL=Outlook, SK.
[5] SK=Saskatoon, SK.
[6] Cultivar mean for all available data. Shaded values indicate the minimum or maximum value within a column.

Table 45. Summary of fruit characteristics of black currant fruit for each year harvested and for each site harvested with means for all data collected.

Cultivar	Year Site	Ten Fruit Weight (g)		% TotalSolids		pH		SolubleSolids (°Brix)		Total Titratable Acidity (% Citric Acid)		L.Value		HueAngle	
25-23-23	98	13.2[1]	(1.08)[2]	18.7	(1.05)	3.1	(0.60)	13.4	(0.82)	3.66	(0.11)	15.9	(1.34)	16.7	(0.57)
	99	12.5	(0.93)	20.1	(0.69)	3.1	(0.02)	14.0	(0.35)	3.29	(0.12)	9.4	(0.97)	12.1	(1.17)
	00	11.2	(0.62)	20.7	(0.45)	3.0	(0.03)	16.3	(0.41)	3.23	(0.07)	7.5	(1.01)	13.9	(0.75)
	SK[3]	12.3	(1.01)	20.0	(0.56)	3.1	(0.04)	15.0	(0.52)	3.31	(0.10)	8.8	(1.19)	12.4	(0.75)
	YK[4]	12.0	(0.46)	21.1	(0.55)	3.0	(0.02)	14.7	(0.53)	3.36	(0.130	10.6	(1.37)	14.6	(0.96)
	Mn[5]	12.1	(0.51)	20.1	(0.42)	3.0	(0.02)	14.8	(0.38)	3.34	(0.09)	9.9	(0.92)	13.7	(0.64)
5-23-42	98	9.9	(0.77)	22.2	(0.74)	3.2	(0.04)	16.1	(0.58)	3.73	(0.11)	21.3	(1.34)	15.9	(0.57)
	99	12.8	(1.02)	23.3	(0.76)	3.0	(0.02)	15.2	(0.38)	2.97	(0.12)	10.1	(1.07)	13.3	(1.28)
	00	12.5	(0.62)	21.8	(0.45)	3.0	(0.03)	16.9	(0.41)	3.14	(0.07)	9.2	(1.01)	13.4	(0.75)
	SK	11.5	(0.88)	23.6	(0.49)	3.1	(0.03)	16.7	(0.45)	3.09	(0.11)	10.8	(1.31)	14.0	(0.82)
	YK	11.8	(0.46)	21.2	(0.55)	3.0	(0.02)	15.5	(0.53)	3.27	(0.13)	12.9	(1.37)	13.9	(0.96)
	Mn	11.7	(0.48)	22.4	(0.39)	3.1	(0.02)	16.1	(0.36)	3.20	(0.09)	12.1	(0.95)	13.9	(0.67)
5-24-9	98	9.6	(1.36)	22.5	(1.32)	3.2	(0.08)	15.0	(1.03)	-	-	-	-	-	-
	99	12.4	(0.93)	22.1	(0.69)	3.2	(0.02)	14.1	(035)	3.06	(0.12)	11.4	(0.97)	13.4	(1.17)
	00	9.6	(0.62)	22.9	(0.45)	3.2	(0.03)	17.0	(0.41)	3.03	(0.07)	7.6	(1.01)	14.2	(0.75)
	SK	12.5	(1.01)	21.9	(0.56)	3.2	(0.04)	15.0	(0.52)	3.10	(0.10)	11.0	(1.19)	14.6	(1.17)
	YK	9.5	(0.49)	22.9	(0.59)	3.2	(0.02)	15.8	(0.56)	2.99	(0.16)	8.1	(1.68)	13.1	(0.72)
	Mn	10.8	(0.53)	22.5	(0.43)	3.2	(0.02)	15.5	(0.39)	3.04	(0.10)	9.5	(1.04)	13.8	(0.72)
Boskoop Giant	98	8.5	(1.08)	19.0	(1.05)	2.9	(0.06)	13.8	(0.82)	4.89	(0.14)	14.7	(1.71)	16.8	
	99	7.8	(1.14)	22.2	(0.85)	3.0	(0.03)	14.5	(0.49)	3.52	(0.22)	10.8	(1.37)	12.4	(1.65)

	00	7.7	(0.62)	20.0	(0.45)	2.9	(0.03)	16.0	(0.41)	3.94	(0.07)	8.2	(1.01)	14.8	(0.75)
	SK	8.3	(1.24)	20.5	(0.69)	3.0	(0.04)	15.4	(0.64)	3.76	(0.12)	11.2	(1.46)	15.4	(0.93)
	YK	7.7	(0.46)	20.4	(0.55)	3.0	(0.02)	14.9	(0.56)	4.23	(0.16)	9.5	(1.56)	14.0	(1.09)
	Mn	7.9	(0.55)	20.4	(0.45)	3.0	(0.02)	15.1	(0.42)	4.04	(0.11)	10.1	(1.08)	14.5	(0.75)
Consort	98	7.7	(1.08)	21.2	(1.05)	3.0	(0.06)	14.4	(0.82)	4.80	(0.11)	14.4	(1.34)	16.3	(0.57)
	99	8.8	(0.93)	23.2	(0.69)	2.9	(0.02)	15.2	(0.35)	3.96	(0.12)	9.2	(0.97)	10.9	(1.17)
	00	7.8	(0.62)	22.6	(0.45)	2.9	(0.03)	17.4	(0.41)	4.10	(0.07)	8.0	(1.01)	13.2	(0.75)
	SK	7.8	(0.95)	22.9	(0.52)	2.9	(0.03)	16.4	(0.49)	4.18	(0.09)	8.9	(1.11)	12.9	(0.70)
	YK	8.2	(0.49)	22.4	(0.59)	3.0	(0.02)	15.5	(0.57)	4.19	(0.14)	10.5	(1.47)	12.7	(1.02)
	Mn	8.1	(0.51)	22.6	(0.42)	2.9	(0.02)	15.9	(0.38)	4.18	(0.09)	9.8	(0.93)	12.9	(0.64)
Magnus	98	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	99	8.0	(0.93)	24.3	(0.69)	3.0	(0.02)	15.3	(0.35)	3.98	(0.15)	11.0	(1.19)	11.8	(1.17)
	00	7.0	(0.62)	22.8	(0.45)	3.0	(0.02)	17.3	(0.41)	3.49	(0.07)	8.8	(1.01)	13.2	(0.75)
	SK	7.9	(1.01)	22.5	(0.56)	3.0	(0.04)	15.5	(0.52)	3.93	(0.10)	11.5	(1.19)	12.9	(0.75)
	YK	7.1	(0.56)	24.5	(0.68)	3.0	(0.02)	17.1	(0.65)	3.30	(0.20)	8.3	(1.68)	11.2	(1.17)
	Mn	7.5	(0.57)	23.5	(0.47)	3.0	(0.02)	16.3	(0.42)	3.68	(0.11)	9.9	(1.04)	12.0	(0.72)
Topsy	98	5.1	(1.94)	24.0	(1.89)	3.1	(0.11)	17.0	(1.47)	-	-	-	-	-	-
	99	9.1	(1.14)	23.4	(0.85)	3.0	(0.03)	15.0	(0.43)	3.90	(0.15)	11.6	(1.19)	12.4	(1.44)
	00	6.7	(0.62)	23.2	(0.45)	3.0	(0.03)	17.7	(0.45)	3.81	(0.08)	7.9	(1.01)	13.6	(0.75)
	SK	8.2	(1.01)	22.6	(0.56)	3.0	(0.04)	15.9	(0.52)	3.97	(0.10)	9.9	(1.19)	16.7	(0.75)
	YK	6.5	(0.63)	24.3	(0.75)	3.0	(0.03)	17.5	(0.82)	3.59	(0.23)	8.8	(2.42)	13.5	(1.69)
	Mn	7.4	(0.60)	23.3	(0.49)	3.0	(0.02)	16.6	(0.47)	3.84	(0.12)	9.6	(1.20)	13.1	(0.83)
Wellington	98	10.9	(0.84)	20.2	(0.82)	3.0	(0.05)	15.3	(0.64)	4.63	(0.10)	14.3	(1.18)	16.7	(0 50)

	99	12.0	(0.93)	22.6	(0.69)	2.9	(0.02)	14.9	(0.35)	3.83	(0.14)	12.5	(0.97)	13.0	(1.17)
	00	10.7	(0.62)	20.3	(045)	2.8	(0.03)	16.2	(0.41)	3.93	(0.07)	10.3	(1.01)	13.8	(0.75)
	SK	10.2	(0.88)	22.6	(0.49)	3.0	(0.04)	15.7	(0.45)	4.15	(0.10)	11.6	(1.10)	13.5	(0.70)
	YK	12.0	(0.46)	20.7	(0.55)	2.8	(0.02)	15.3	(0.53)	4.04	(0.13)	12.4	(1.37)	14.5	(0.96)
	Mn	11.2	(0.48)	21.1	(0.39)	2.9	(0.02)	15.5	(0.36)	4.08	(0.09)	12.1	(0.90)	14.2	(0.62)
Willoughby	98	8.9	(1.08)	21.2	(1.05)	3.0	(0.06)	14.3	(0.82)	4.21	(0.21)	15.2	(2.48)	16.3	(1.05)
	99	9.7	(0.93)	23.5	(0.69)	3.0	(0.02)	14.9	(0.35)	3.75	(0.12)	14.2	(0.97)	15.4	(1.17)
	00	8.8	(0620	21.8	(0.45)	3.0	(0.03)	17.1	(0.41)	3.60	(0.07)	8.7	(1.00)	13.1	(0.75)
	SK	9.3	(1.01)	22.1	(0.56)	3.0	(0.04)	15.6	(0.52)	3.82	(0.10)	12.1	(1.19)	15.3	(0.75)
	YK	9.1	(0.46)	22.6	(0.55)	3.0	(0.02)	15.7	(0.53)	3.62	(0.15)	11.3	(1.56)	13.6	(1.09)
	Mn	9.2	(0.51)	22.4	(0.42)	3.0	(0.02)	15.6	(0.38)	3.71	(0.10)	11.7	(1.00)	14.4	(0.69)

[1] Least square mean.
[2] Standard error of least square mean.
[3] SK=Saskatoon, SK.
[4] YK=Yorkton, SK.
[5] Cultivar mean for all available data.
[6] Data unavailable.
Shaded values indicate the minimum or maximum value within a column.

Table 46. Summary of fruit characteristics of pin cherry fruit for each year harvested and for each site harvested with means for all data collected.

Cultivar	Year Site	Ten Fruit Weight (g)		% TotalSolids		pH		SolubleSolids (°Brix)		% Pit (w/w)		I.Value		HueAngle	
Jumping Pound	98	5.9[1]	(0.13)[2]	26.1	(0.85)	3.3	(0.01)	20.4	(1.10)	5.7	(0.07)	-[3]	-	-	-
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	00	7.0	(0.31)	22.8	(1.11)	3.1	(0.02)	17.4	(0.86)	6.3	(0.48)	16.1	(0.63)	17.6	(0.34)
	OL[4]	6.4	(0.32)	17.8	(2.33)	3.1	(0.03)	17.6	(1.50)	6.3	(0.52)	15.9	(0.86)	17.6	(0.82)

	SK[5]	6.7	(0.39)	20.1	(2.67)	3.2	(0.04)	18.5	(0.87)	6.1	(0.33)	16.4	(0.83)	17.8	(0.54)
	Mn[6]	6.6	(0.27)	19.3	(1.73)	3.1	(0.03)	18.3	(0.77	6.1	(0.27)	16.0	(0.61)	17.6	(0.45)
Lee#4	98	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	00	7.0	(0.31)	22.7	(1.11)	3.1	(0.02)	16.6	(0.86)	7.4	(0.48)	19.2	(0.63)	20.2	(0.34)
	OL	6.7	(0.28)	19.0	(2.33)	3.2	(0.03)	16.7	(1.33)	7.3	(0.46)	19.0	(0.77)	20.5	(0.73)
	SK	7.6	(0.49)	14.9	(3.32)	3.1	(0.05)	14.1	(1.09)	7.2	(0.41)	21.2	(0.73)	21.6	(0.48)
	Mn	7.1	(0.28)	17.1	(1.84)	3.1	(0.03)	15.4	(0.82)	7.3	(0.29)	20.0	(0.54)	21.0	(0.40)
Mary Liss	98	8.5	(0.13)	25.6	(0.85)	3.3	(0.01)	19.6	(1.10)	6.1	(0.07)	-	-	-	-
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	00	7.5	(0.44)	20.2	(1.56)	3.1	(0.03)	16.6	(1.22)	5.5	(0.67)	16.0	(0.89)	17.7	(0.48)
	OL	7.7	(0.69)	20.1	(5.05)	3.1	(0.07)	13.0	(3.26)	6.8	(1.23)	16.9	(1.87)	18.6	(1.79)
	SK	6.7	(0.39)	19.7	(2.67)	3.2	(0.04)	18.1	(0.87)	5.8	(0.33)	16.0	(0.83)	17.7	(0.54)
	Mn	6.8	(0.32)	19.9	(2.07)	3.2	(0.04)	17.2	(0.92)	5.8	(0.32)	16.0	(0.82)	17.8	(0.60)

[1] Least square mean.
[2] Standard error of least square mean.
[3] Data unavailable.
[4] OL=Outlook, SK. [5] SK=Saskatoon, SK.
[6] Cultivar mean for all available data. Shaded values indicate the minimum or maximum value within a column.

Table 47. Summary of fruit characteristics of highbush cranberry fruit for each year harvested and for each site harvested with means for all data collected.

Cultivar	Year Site	Ten Fruit Weight (g)		% TotalSolids		pH		SolubleSolids (°Brix)		% Pit (w/w)		L Value		HueAngle	
Alaska	99	6.3[1]	(0.24)[2]	20.0	(1.01)	3.1	(0.01)	11.3	(0.37)	5.8	(0.14)	16.6	(1.03)	16.4	(0.14)
	00	6.3	(0.14)	19.8	(0.32)	3.0	(0.01)	14.0	(0.26)	7.5	(0.27)	13.4	(0.28)	15.4	(0.16)

	OL[3]	5.8	(0.18)	21.2	(0.73)	3.1	(0.03)	13.9	(0.73)	6.7	(0.36)	14.0	(1.45)	15.7	(0.53)
	SK[4]	6.8	(0.18)	18.7	(0.73)	3.0	(0.02)	11.9	(0.65)	6.8	(0.37)	15.5	(0.93)	16.0	(0.25)
	Mn[5]	6.3	(0.14)	19.9	(0.53)	3.0	(0.01)	12.8	(0.49)	6.7	(0.26)	14.7	(0.80)	15.8	(0.23)
Andrews	99	4.1	(0.34)	18.6	(1.42)	3.2	(0.02)	9.0	(0.47)	6.3	(0.18)	20.7	(1.31)	18.0	(0.19)
	00	4.2	(0.20)	17.6	(0.45)	3.1	(0.02)	11.5	(0.37)	7.2	(0.38)	16.9	(0.39)	17.1	(0.22)
	OL	-[6]	-	-	-	-	-	-	-	-	-	-	-	-	-
	SK	4.1	(0.18)	18.1	(0.73)	3.1	(0.02)	10.2	(0.65)	6.8	(0.37)	18.8	(0.93)	17.6	(0.25)
	Mn	4.1	(0.20)	18.1	(0.75)	3.1	(0.02)	10.2	(0.66)	6.8	(0.35)	18.8	(1.09)	17.6	(0.31)
Espenant	99	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	00	5.7	(0.20)	18.4	(0.45)	2.9	(0.02)	13.7	(0.37)	6.5	(0.38)	18.0	(0.39)	17.2	(0.22)
	OL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SK	5.7	(0.26)	18.4	(1.03)	2.9	(0.02)	13.7	(0.92)	6.5	(0.52)	18.0	(1.31)	17.2	(0.36)
	Mn	5.7	(0.29)	18.1	(0.75)	2.9	(0.03)	13.7	(0.93)	6.5	(0.50)	18.0	(1.53)	17.2	(0.43)
Garry Pink	99	6.5	(0.34)	21.4	(1.42)	3.0	(0.02)	9.5	(0.47)	7.0	(0.18)	19.4	(1.31)	17.6	(0.19)
	00	6.1	(0.20)	19.4	(0.45)	3.0	(0.02)	12.3	(0.37)	8.9	(0.38)	15.9	(0.39)	16.6	(0.22)
	OL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SK	6.2	(0.18)	20.4	(0.73)	3.0	(0.02)	10.9	(0.65)	8.0	(0.37)	17.7	(0.93)	17.1	(0.25)
	Mn	6.3	(0.20)	18.4	(1.06)	3.0	(0.02)	10.9	(0.66)	8.0	(0.35)	17.7	(1.09)	17.1	(0.31)
Manito	99	7.8	(0.34)	18.1	(1.42)	2.9	(0.02)	12.0	(0.47)	4.0	(0.18)	23.1	(1.31)	18.5	(0.19)
	00	6.9	(0.20)	18.9	(0.45)	2.9	(0.02)	14.7	(0.37)	5.1	(0.38)	19.5	(0.39)	17.9	(0.22)
	OL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SK	7.3	(0.18)	18.5	(0.73)	2.9	(0.02)	13.3	(0.65)	4.6	(0.37)	21.3	(0.93)	18.2	(0.25)
	Mn	7.3	(0.20)	18.5	(0.75)	2.9	(0.02)	13.3	(0.66)	4.6	(0.35)	21.3	(1.09)	18.2	(0.31)

Phillips	99	3.8	(0.24)	20.0	(1.01)	3.3	(0.01)	11.8	(0.37)	5.9	(0.14)	17.7	(1.03)	17.6	(0.14)
	00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	OL	3.7	(0.26)	20.6	(1.03)	3.3	(0.05)	12.1	(1.18)	5.6	(0.59)	13.8	(2.35)	17.4	(0.86)
	SK	3.8	(0.26)	19.4	(1.03)	3.2	(0.02)	11.5	(0.92)	6.0	(0.52)	20.1	(1.31)	17.7	(0.36)
	Mn	3.8	(0.20)	20.0	(0.75)	3.3	(0.02)	11.8	(0.72)	5.9	(0.39)	17.6	(1.19)	17.6	(0.34)
Wentworth	99	5.8	(0.24)	20.1	(1.01)	3.1	(0.01)	11.3	(0.33)	6.0	(0.13)	19.2	(0.93)	17.4	(0.13)
	00	5.8	(0.14)	20.4	(0.32)	3.0	(0.01)	14.6	(0.26)	7.4	(0.27)	13.7	(0.28)	15.4	(0.16)
	OL	5.9	(0.18)	20.1	(0.73)	3.0	(0.03)	13.5	(0.65)	6.3	(0.33)	15.9	(1.30)	16.1	(0.48)
	SK	5.7	(0.18)	20.3	(0.73)	3.0	(0.02)	12.4	(0.65)	7.1	(0.37)	17.0	(0.93)	16.7	(0.25)
	Mn	5.8	(0.14)	20.2	(0.53)	3.0	(0.01)	12.9	(0.47)	6.7	(0.25)	16.4	(0.77)	16.4	(0.22)

[1] Least square mean.
[2] Standard error of least square mean.
[3] OL=Outlook, SK.
[4] SK=Saskatoon, SK.
[5] Cultivar mean for all available data.
[6] Data unavailable.
Shaded values indicate the minimum or maximum value within a column.

3.7 Figures

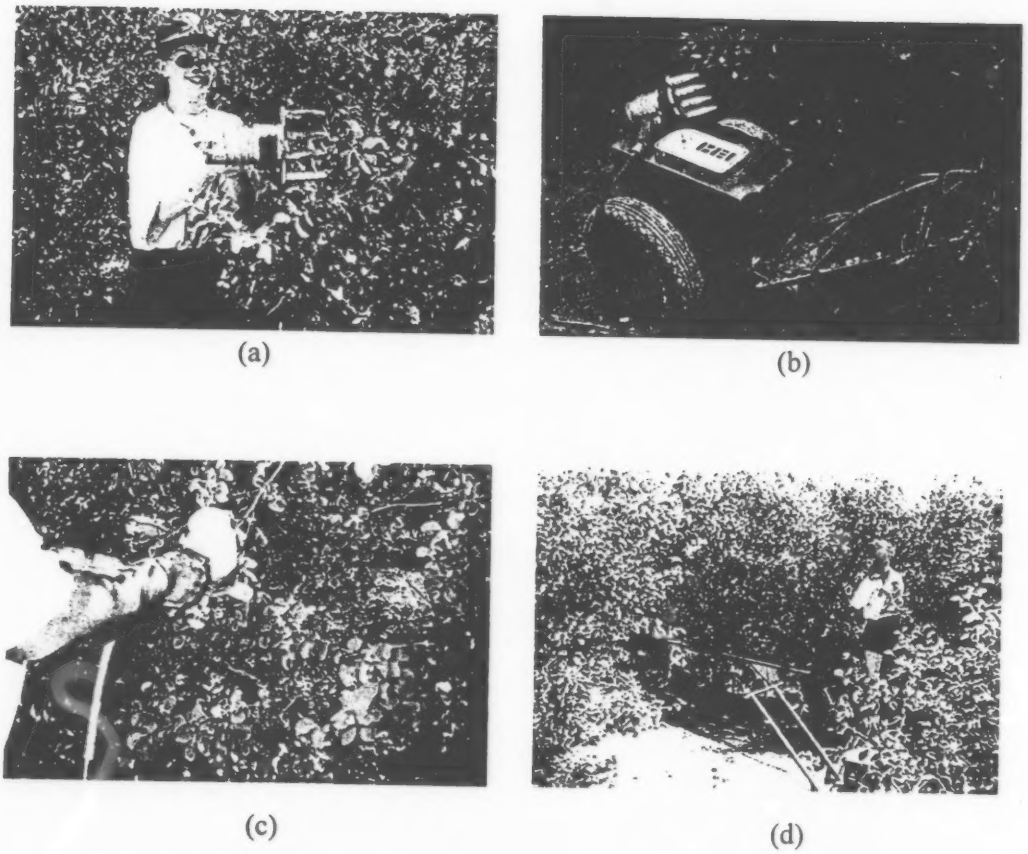


Figure 1. Collection of saskatoon fruit with a handheld harvester (BEI, South Haven, MI): (a) Handheld shaker; (b) Handheld shaker with cart containing batteries and a battery charger; (c) Handheld shaker being raked along branch; (d) Catch frame positioned under tree to catch fruit (W. Ziehl 1998).

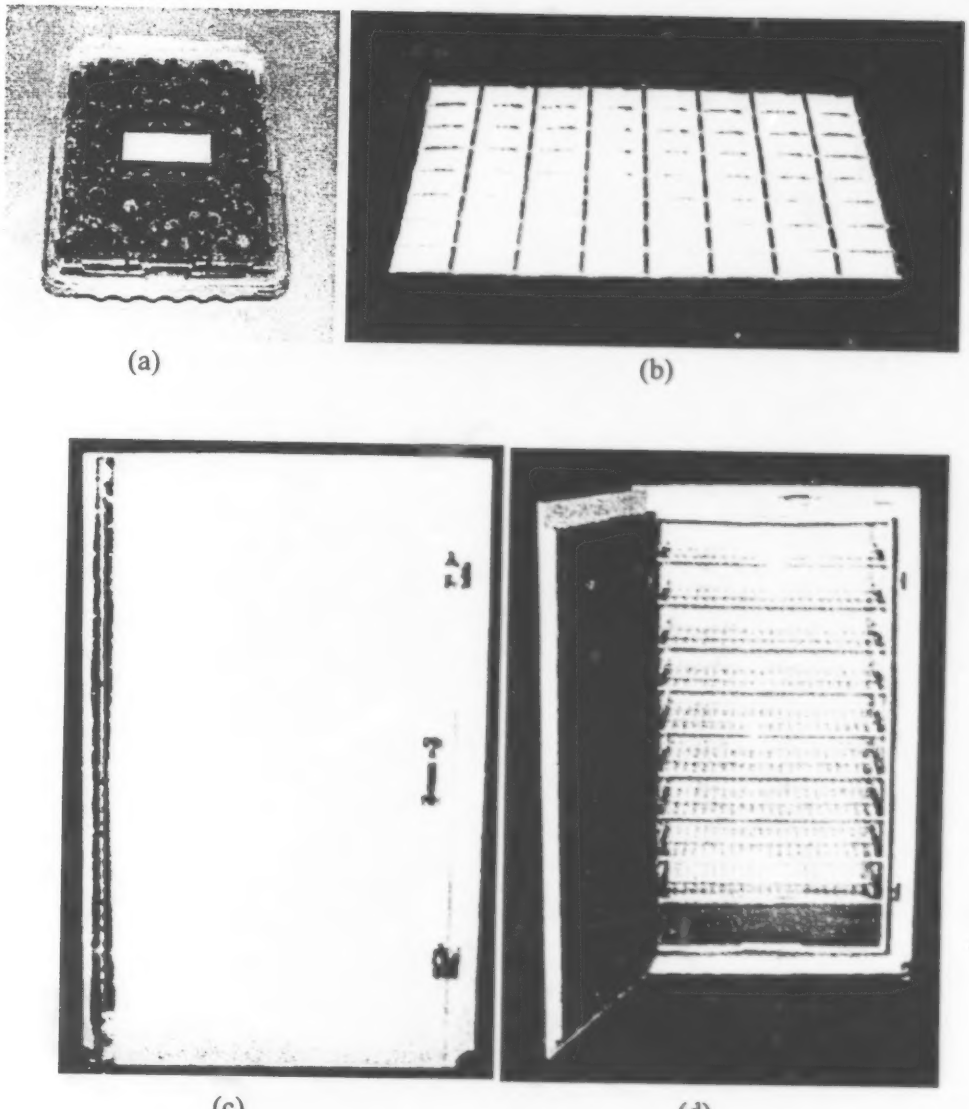


Figure 2. Storage of saskatoon fruit while being transported from the field to the freezer: (a) Plastic fruit container (25 x 19 x8 cm); (b) Reusable ice substitute laid on the shelves of the field cooler; (c) Outside of the field cooler; (d) Inside of the field cooler (W. Ziehl 1998).

(a) (b)

Figure 3. Total solids content analysis of saskatoon fruit: (a) Saskatoon fruit prior to drying in vacuum oven; (b) Saskatoon fruit subsequent to drying for twenty-four hours at 70°C (W.Ziehl 1998).

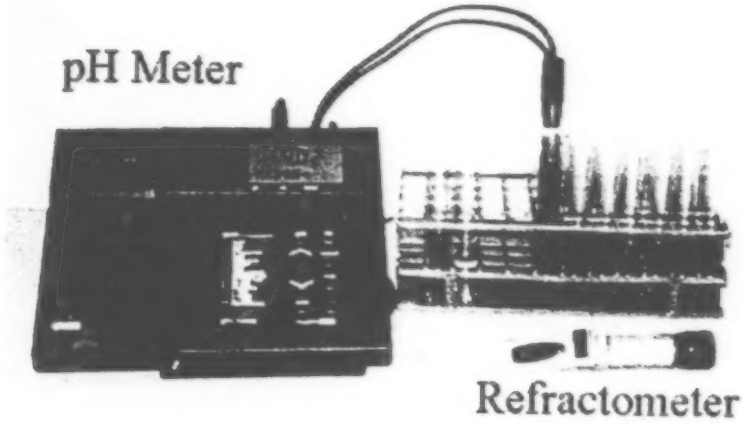


Figure 4. Instruments used to determine pH (pH meter) and soluble solids content (refractometer) of fruit juice extracts (W. Ziehl 1998).

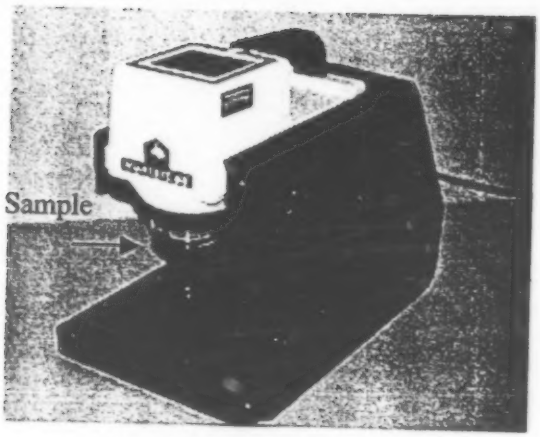


Figure 5. The Miniscan XE colourimeter used to measure the colour of saskatoon fruit and juice extracts (W. Ziehl 2001).

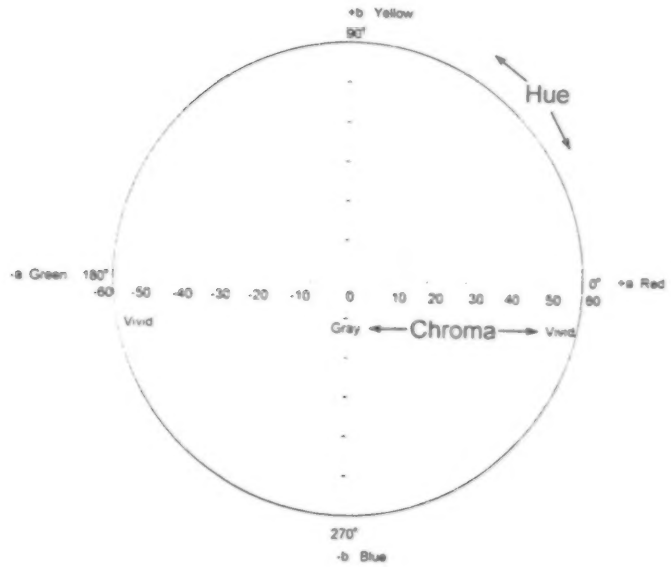
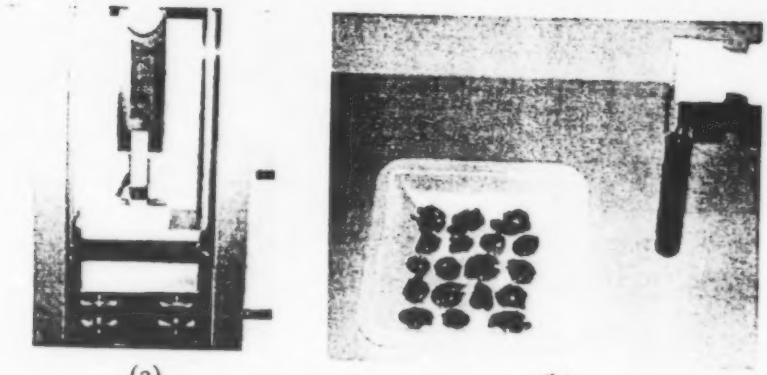
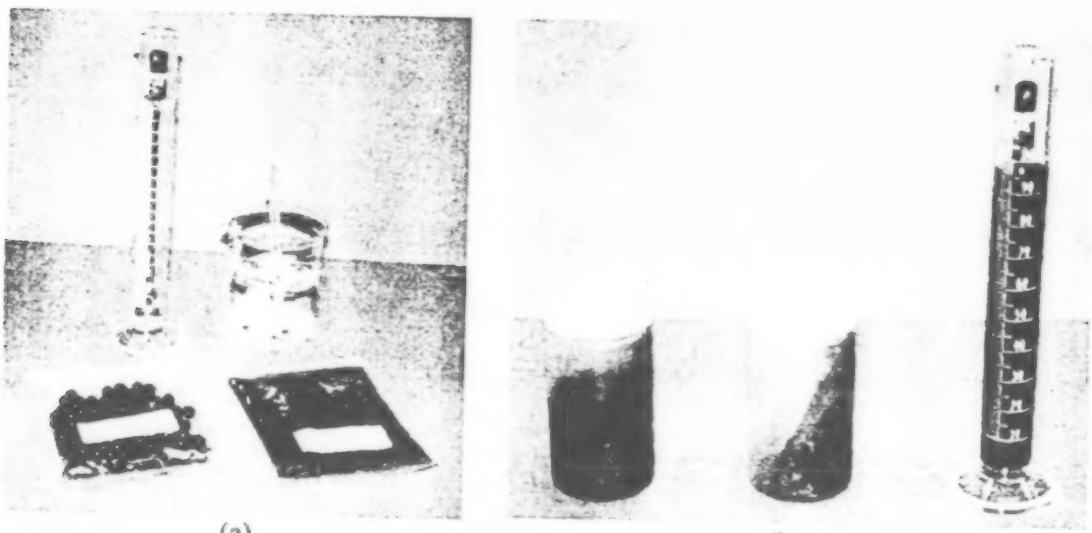


Figure 6. The hue and chroma of colour as interpreted by a and b values.



(a) (b)

Figure 7. Determination of volume of juice extracted from saskatoon fruit: (a) Saskatoon fruit being compressed with the TMS-90 texturepress; (b) Compressed saskatoon fruit and resulting juice (W. Ziehl 2000).



(a) (b)

Figure 8. Preparation of juice extracts from chokecherry fruit for pH, soluble solids, and colour analyses: (a) Chokecherry fruit before and after manual maceration with distilled water; (b) Macerated samples after centrifugation and decanting of supernatant (W. Ziehl, 1999).

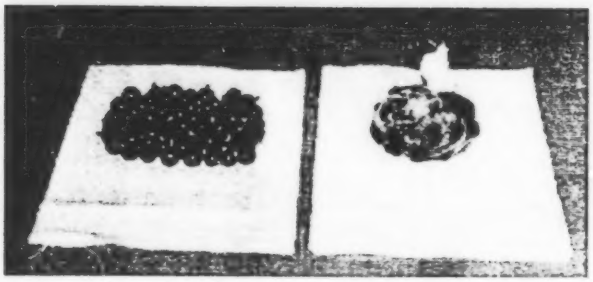
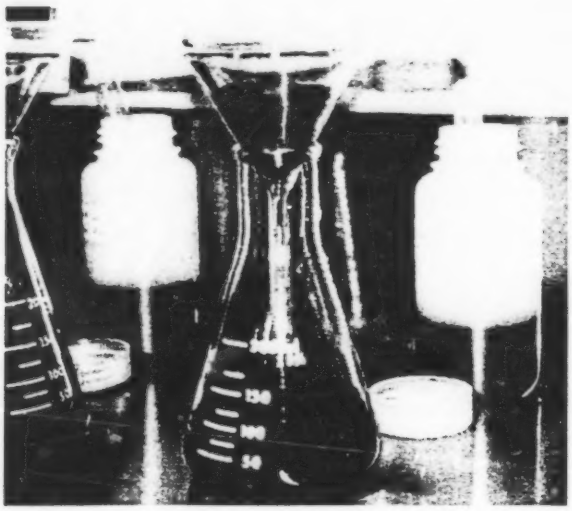
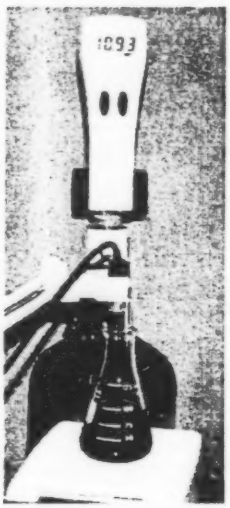


Figure 9. Preparing juice extract from black currant fruit for pH, soluble solids, and colour analyses (W. Ziehl 2000).



(a)



(b)

Figure 10. Titratable acidity analysis of diluted supernatant from black currant fruit: (a) Filtration of supernatant prior to titration; (b) Titration with NaOH to determine total titratable acidity (W. Ziehl 1999).

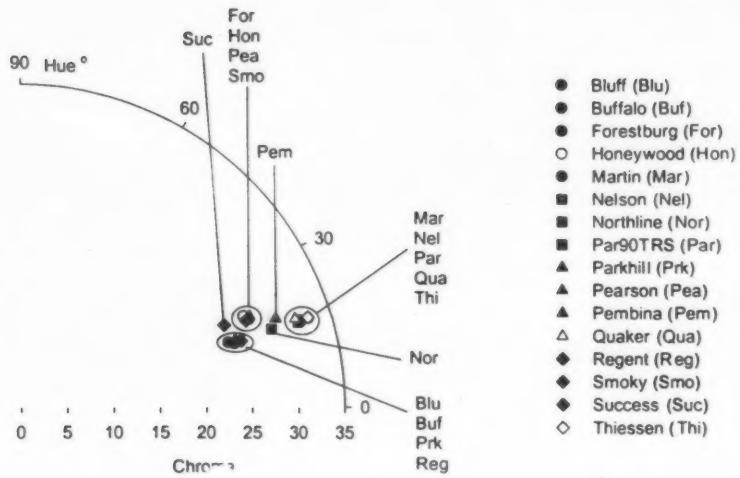


Figure 11. The hue and chroma distribution of the saskatoon fruit extracts of the cultivars harvested in 1999.

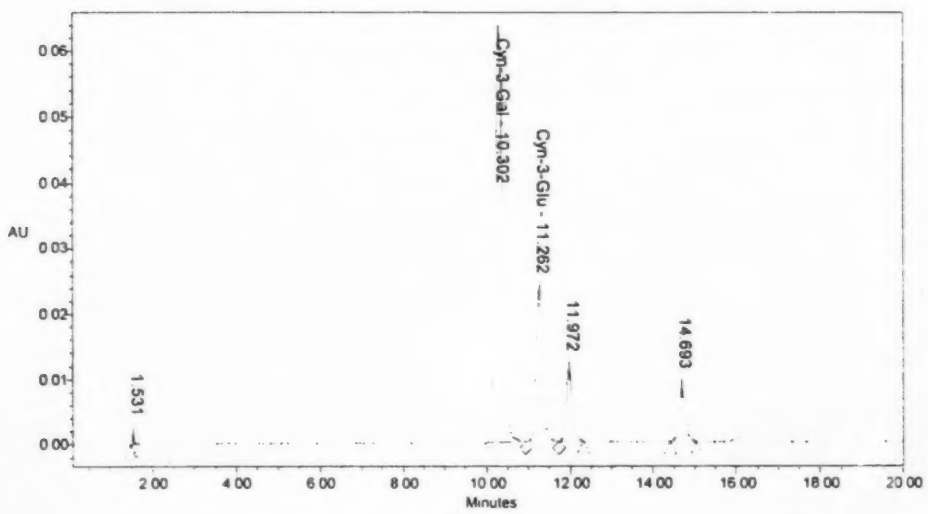


Figure 12. Example of a chromatogram showing the anthocyanin profile of saskatoon fruit.

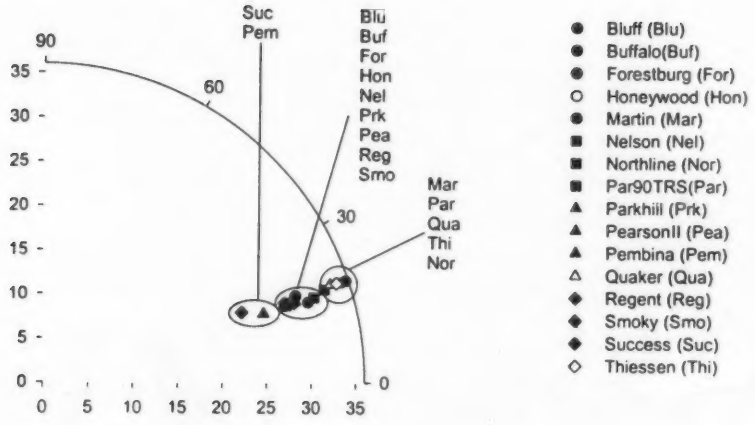


Figure 13. The hue and chroma distribution of the saskatoon fruit extracts of the cultivars harvested in 2000.

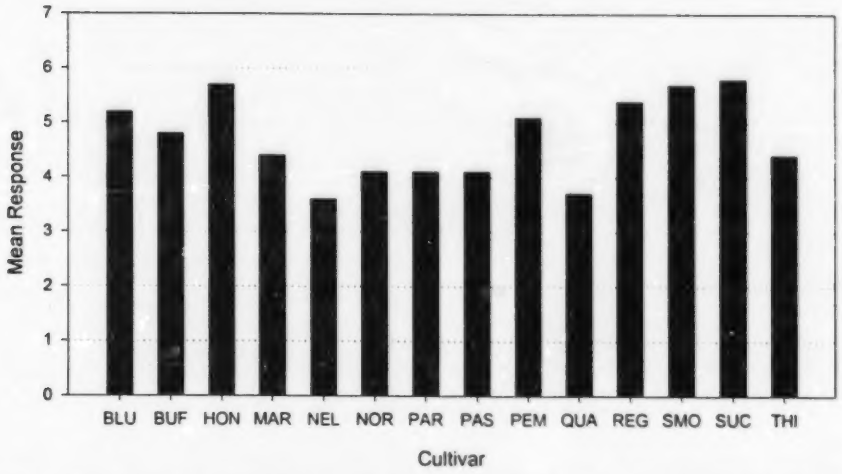


Figure 14. Mean sensory responses for tartness in regards to each cultivar evaluated. Note:BLU=Bluff, BUF=Buffalo, HON=Honeywood, MAR=Martin, NEL=Nelson, NOR=Northline, PAR=Par90TRS, PAS=Pasture, PEM=Pembina, QUA=Quaker, REG=Regent, SMO=Smokey, SUC=Success, THI=Thiessen.

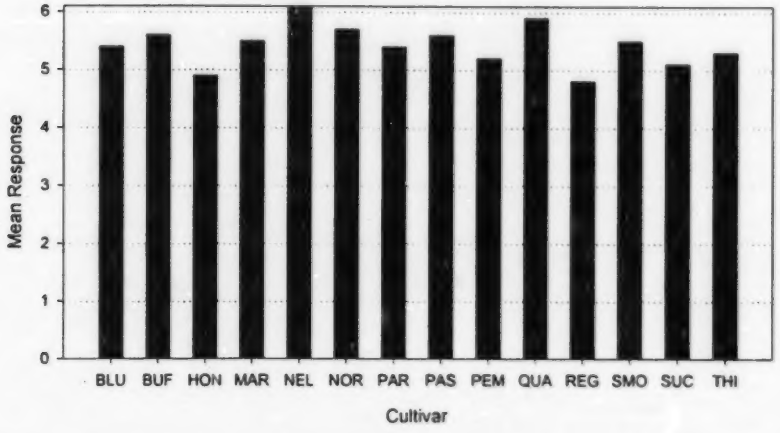


Figure15. Mean sensory responses for sweetness in regards to each cultivar evaluated. Note:BLU=Bluff, BUF=Buffalo, HON=Honeywood, MAR=Martin, NEL=Nelson, NOR=Northline, PAR=Par90TRS, PAS=Pasture, PEM=Pembina, QUA=Quaker, REG=Regent, SMO=Smokey, SUC=Success, THI=Thiessen.

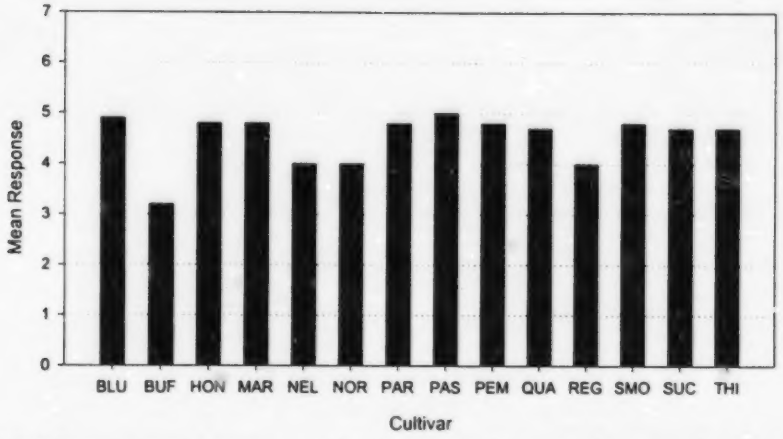


Figure 16. Mean sensory responses for firmness in regards to each cultivar evaluated. Note:BLU=Bluff, BUF=Buffalo, HON=Honeywood, MAR=Martin, NEL=Nelson, NOR=Northline, PAR=Par90TRS, PAS=Pasture, PEM=Pembina, QUA=Quaker, REG=Regent, SMO=Smokey, SUC=Success, THI=Thiessen.

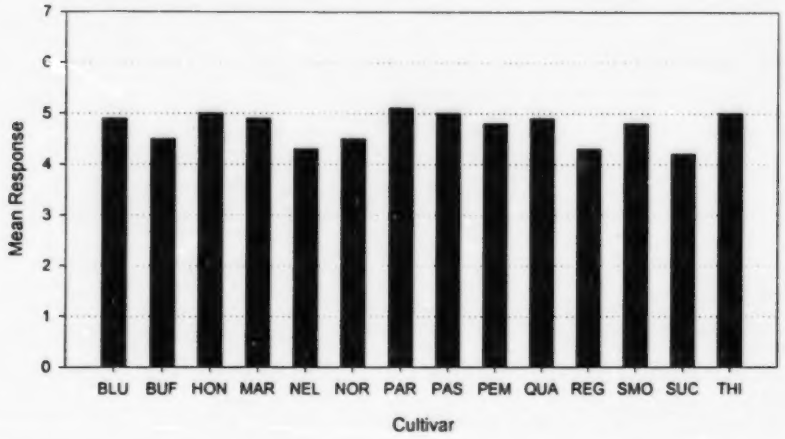


Figure 17. Mean sensory responses for seediness in regards to each cultivar evaluated. Note:BLU=Bluff, BUF=Buffalo, HON=Honeywood, MAR=Martin, NEL=Nelson, NOR=Northline, PAR=Par90TRS, PAS=Pasture, PEM=Pembina, QUA=Quaker, REG=Regent, SMO=Smokey, SUC=Success, THI=Thiessen.

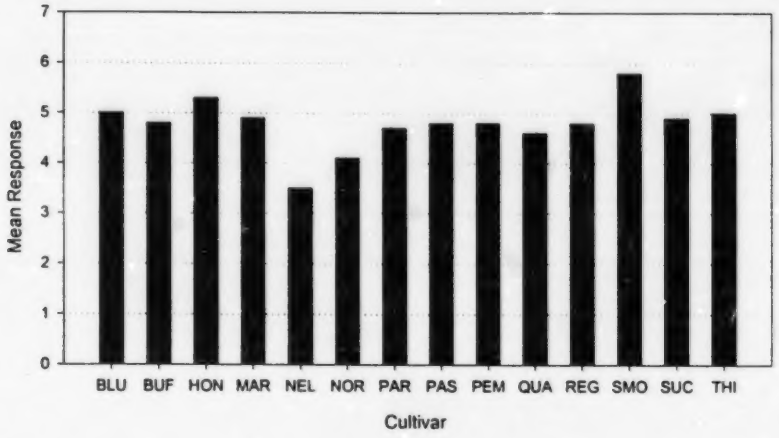


Figure 18. Mean sensory responses for flavour intensity in regard to each cultivar evaluated. Note:BLU=Bluff, BUF=Buffalo, HON=Honeywood, MAR=Martin, NEL=Nelson, NOR=Northline, PAR=Par90TRS, PAS=Pasture, PEM=Pembina, QUA=Quaker, REG=Regent, SMO=Smokey, SUC=Success, THI=Thiessen.

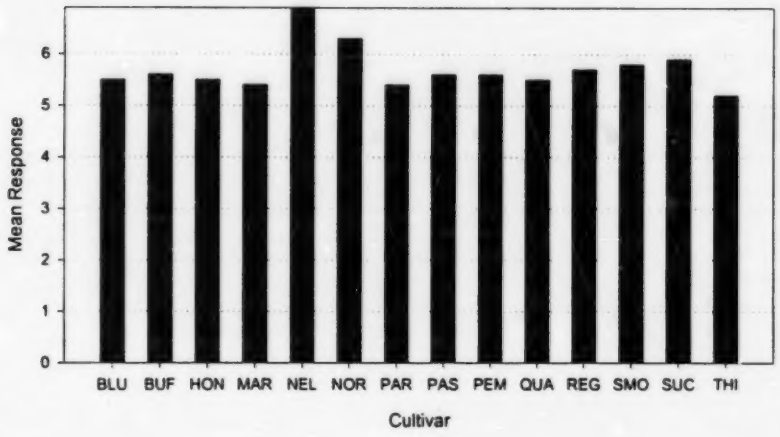
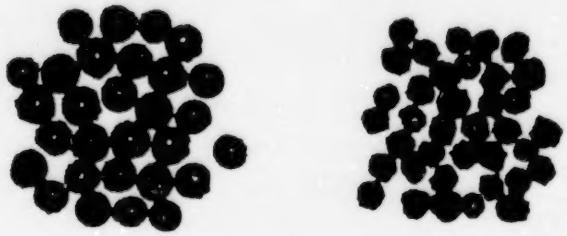


Figure 19. Mean sensory responses for flavour acceptability in regard to each cultivar evaluated. Note:BLU=Bluff, BUF=Buffalo, HON=Honeywood, MAR=Martin, NEL=Nelson, NOR=Northline, PAR=Par90TRS, PAS=Pasture, PEM=Pembina, QUA=Quaker, REG=Regent, SMO=Smokey, SUC=Success, THI=Thiessen.



(a) (b)

Figure 20. Freeze-drying of saskatoon fruit: (a) Saskatoon fruit prior to freeze-drying; (b) and after being subjected to freeze-drying (W. Ziehl 1998).

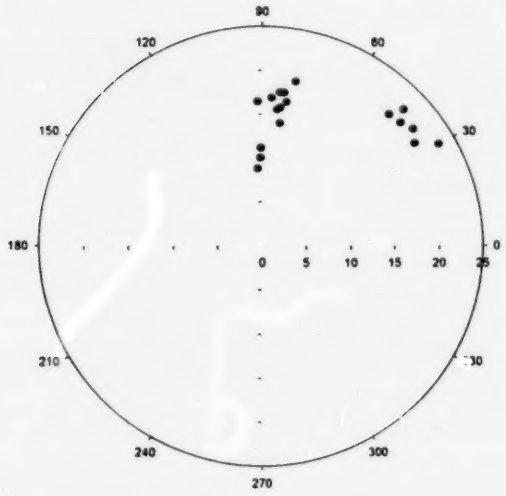


Figure 21. The hue and chroma distribution of the diluted chokecherry fruit extracts from all replicates of the cultivars Garrington, Lee, and Boughen Yellow harvested in 1999.

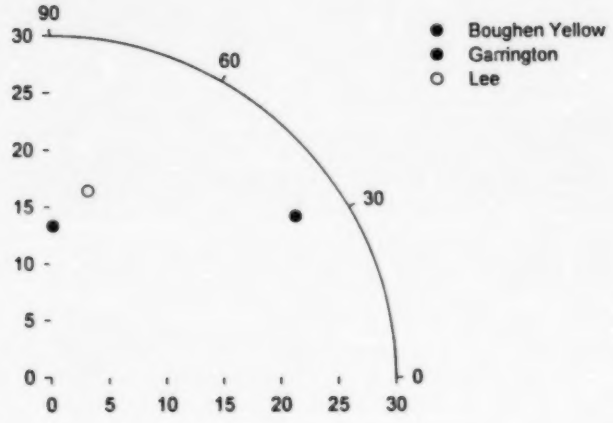


Figure 22. The mean hue and mean chroma distribution of the diluted chokecherry fruit extracts from the cultivars Garrington, Lee, and Boughen Yellow harvested in 2000.

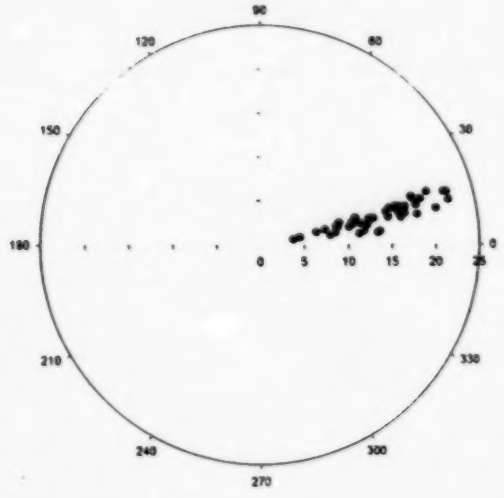


Figure 23. The hue and chroma distribution of the black currant fruit extracts from all replicates of the selections 25-23-23, 5-23-42, and 5-24-9 and of the cultivars Boskoop Giant, Consort, Magnus, Topsy, Wellington, and Willoughby harvested in 1999.

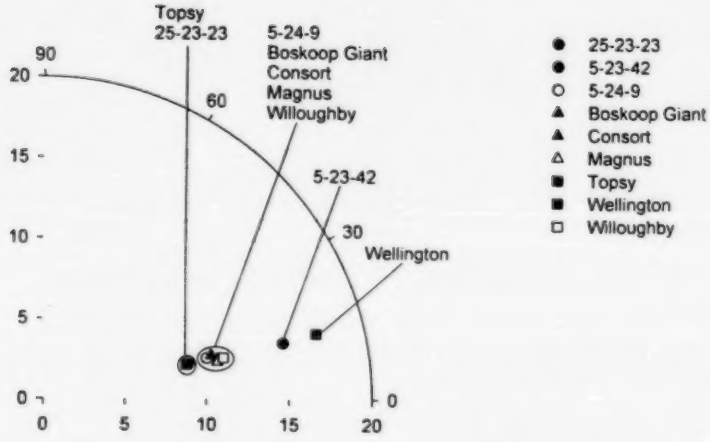


Figure 24. The mean hue and mean chroma distribution of the black currant fruit extracts from the cultivars harvested in 2000.

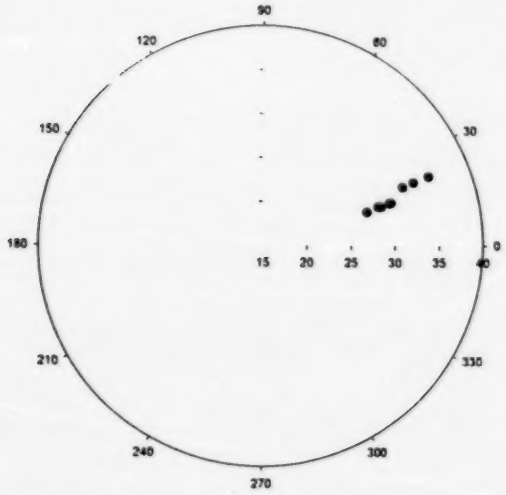


Figure 25. The hue and chroma distribution of the pin cherry fruit extracts from all replicates of the cultivars Jumping Pound, Lee#4, and Mary Liss harvested in 1999.

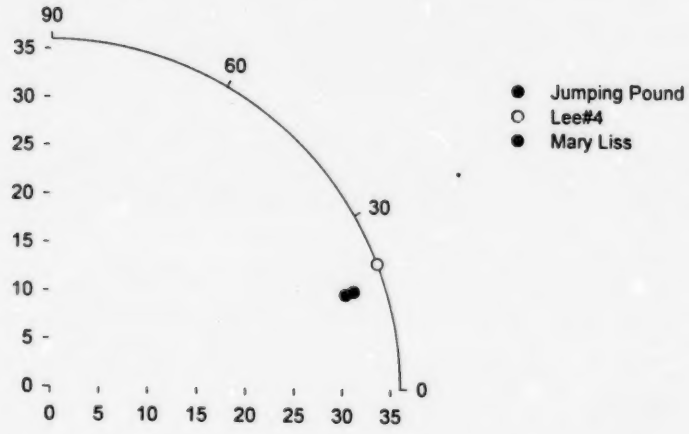


Figure 26. The mean hue and mean chroma distribution of the pincherry fruit extracts from the cultivars harvested in 2000.

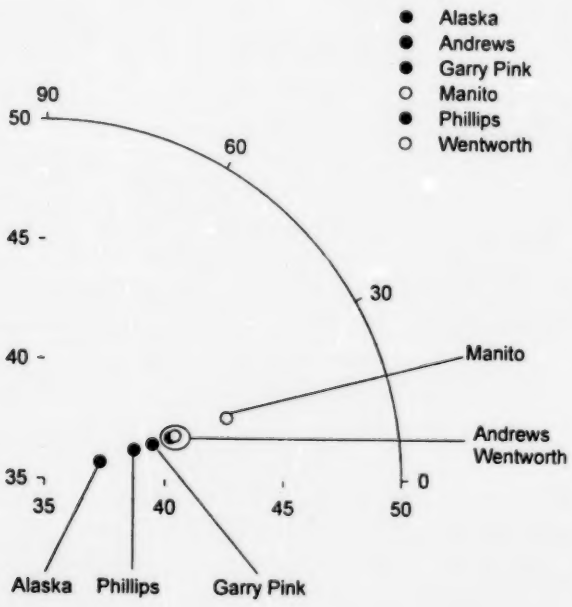


Figure 27. The mean hue and mean chroma distribution of the highbush cranberry fruit extracts from the cultivars harvested in 1999.

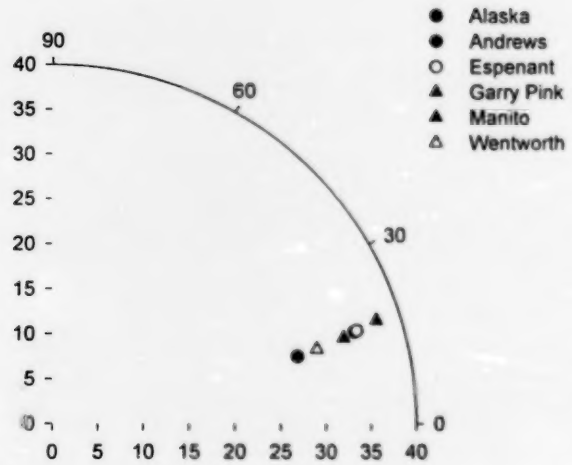


Figure 28. The mean hue and mean chroma distribution of the highbush cranberry fruit extracts from the cultivars harvested in 2000.

4. Personnel

W. Ziehl 100% 1998-2001
C. Greuel/Folkersen 100% 1997-1998

6. Project Developed Materials

Outputs

a) Publications

Book Chapters

Ziehl, W. and R.G. St-Pierre. 1999. A Simple Cooler For Removing Field Heat From Harvested Saskatoons. In R.G. St-Pierre, Growing Saskatoons - A Manual For Orchardists. Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK. New chapter.

Bulletins & Factsheets

Greuel, C. and R.G. St-Pierre. 1996. Measuring titratable acidity in fruit juice. Department of Horticulture Science, University of Saskatchewan, Saskatoon, SK. 3 p.

Conference Proceedings

Greuel, C. Measuring Fruit Quality. From Field to Freezer. Chilling and Freezing Technologies for Small Fruits. Saskatchewan FoodTalk. Saskatoon. April 25 and 26.

b) Reports

Ziehl, W. and R.G. St-Pierre, 2000. Fruit Quality Screening for the Development and Evaluation of Saskatoon, Chokecherry, and Other Native Fruit Cultivars and Germplasm. Progress Report - March 1, for Saskatchewan Agriculture and Food, Agriculture Development Fund.

St-Pierre, R.G. 1999. Fruit quality screening for the development and evaluation of saskatoon, chokecherry, and other native fruit cultivars and germplasm. Progress Report - March 1, for Saskatchewan Agriculture and Food, Agriculture Development Fund.

St-Pierre, R.G. 1998. Fruit quality screening for the development and evaluation of saskatoon, chokecherry, and other native fruit cultivars and germplasm. Progress Report - March 1, for Saskatchewan Agriculture and Food, Agriculture Development Fund.

c) Invited Presentations

Ziehl, W. 2000. PostHarvest Primary Processing. Saskatchewan Fruit Grower's Association Workshop - Growers Helping Growers ; Saskatoon, SK; November 25.

Ziehl, W. 1998. Post harvest quality of saskatoons. Saskatoon Berry Production Workshop. Saskatoon, SK; November 20-21.

Greuel, C. 1997. Measuring Fruit Quality. From Field to Freezer. Chilling and Freezing Technologies for Small Fruits. Saskatchewan FoodTalk. Saskatoon. April 25 and 26.

d) Other Presentations

Ziehl, W. and R.G. St-Pierre. 1999. Physicochemical characteristics of saskatoon fruit. Poster Presentation. Annual Meeting of the Canadian Institute of Food Science and Technology, Kelowna, BC; June 6-9.

e) Workshops

Greuel, C. 1997. Fruit wine making. 12 hr course. Division of Extension, University of Saskatchewan, Saskatoon, SK.

Greuel, C. 1997. Horticultural processing. Saskatoon YMCA, Saskatoon, SK.

Greuel, C. 1997. Home beer making. 9 hr course. Division of Extension, University of Saskatchewan, Saskatoon, SK.

8. Acknowledgement

ADF funding was acknowledged in the following:

a) Publications

Book Chapters

Ziehl, W. and R.G. St-Pierre. 1999. A Simple Cooler For Removing Field Heat From Harvested Saskatoons. In R.G. St-Pierre, Growing Saskatoons - A Manual For Orchardists. Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK. New chapter.

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St-Pierre, R.G. 1999. Fruit quality screening for the development and evaluation of saskatoon, chokecherry, and other native fruit cultivars and germplasm. Progress Report - March 1, for Saskatchewan Agriculture and Food, Agriculture Development Fund.

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